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Modern Freight Car Estimating

CONTAINING

NECESSARY INFORMATION AND TABLES

APPERTAINING TO THE

PROPER METHOD OF COMPILING

Correct Estimates on Freight Equipment.

FOR CAR MANUFACTURERS
AND RAILROAD OFFICIALS.

Edited by O. M. STIMSON.

Anniston, Ala.
1897.

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PREFACE.

The author, in undertaking to write a treatise upon the subject of estimating cost of railroad freight equipment, was convinced that a real necessity existed for its production, and sends it forth, believing that it will fill a place hitherto unoccupied. The need of such a work was frequently brought to my attention by mechanical engineers and others at the time I was connected with Pullman's Palace Car Company, but I felt reluctant to take up the enterprise, owing to lack of time and suitable opportunity. However, I trust the following pages may be found to contain sufficient information upon the subject to win for the book at least, a measure of success.

INTRODUCTION.

In presenting this work to the attention of railroad officials, car manufacturers and mechanical engineers, it seems advisable to mention that the author found it impossible to properly describe the method of estimating cost without using extensive illustrations and details in connection therewith. No attempt has been made to advance new theories, it being only desired to reduce to concise form the varied information essential to enable the compiling of accurate estimates.

The person intrusted with the duty of preparing an estimate sometimes fails to appreciate the importance of carefully considering each detail entering into the construction of a car. Accuracy is absolutely essential, as the margin of profit is so small at the best, that a slight omission or oversight may cause heavy losses.

The above remarks are equally applicable if accuracy is not attained in dealing with weights and measures. Many tables have been produced by the leading manufacturers which treat upon weights and measures of the various materials entering into car construction. Some of these tables differ widely in the results shown for the same material, therefore, a great deal of care has been exercised by the writer in selecting and reducing to a concise form the various tables which are included in this work.

In compiling this book it has been found impossible to omit from the various comparisons, such materials as are usually considered common to all, therefore, the comparisons are based on the use of all material necessary for its application, using as a basis, as nearly as possible, the standards that have been adopted, or set forth as recommended practice by the Master Car Builders' Association, and it deals with quantities only, leaving the purchaser to supply prices which may be peculiar to his own territory.

It should also be noted in figuring the weights and measures of the various materials, that whenever the fraction is less than one-half, it is omitted, and whenever it is more than one-half, it is counted as a whole number, it having been found from actual experience that in the course of a year the account would practically balance.

The specifications of various railroads are so often referred to in considering the quality of materials, tests, etc., that an appendix is presented which includes complete specifications for all materials used by the Pennsylvania Railroad Company in the construction of freight equipment.

No table, or method of figuring lumber is included herein, as Chapin's Lumber Reckoner is considered very complete for this purpose, and it is doubtless already in the hands of, and familiar to every freight car estimator.

To enable the purchaser to have detailed comparisons of his own standard freight equipment in a condensed form, an appendix is added covering blank forms for complete bills of material and summary of same for flat, gondola, box, and stock cars which, when properly filled in, will be found of valuable assistance for all estimating purposes.

The car manufacturers and railroads of this country are using the United States standard nuts and washers exclusively, and therefore weights and dimensions according to that table only are shown.

To enable correction of this edition from time to time on account of changes or improvements that may have been found necessary in the devices illustrated herein, the writer respectfully requests manufacturers, patentees and railroad supply companies to send notice of such changes or improvements to him.

O. M. STIMSON.

Anniston, Ala., January 1st. 1897.

CHAPTER I.

COMPILING OF ESTIMATES.

The increased keenness of competition in the manufacture of freight cars renders the proper compiling of estimates of cost on which to submit bids of very great importance.

The difficulty of accomplishing this task is increased by the fact that nearly all contracts for freight cars are awarded, or at least figures are requested to be submitted within so short a time that the estimator or engineer hardly has time in which to compile an intelligent estimate, and ofttimes the drawings and specifications are either contradictory or ambiguous, necessitating a visit to the railroad company's mechanical department in order that all points may be clearly understood.

There are also so many patented devices entering into the construction of a modern freight car, and so much influence is brought to bear upon railroad managers for the consideration of same in the contemplated new equipment, that scarcely a request is made for figures upon the cost of a car that does not also include requests for alternate figures on account of some special device, and ofttimes these requests are made but a few hours before the contract is let, thus requiring a quick as well as a correct answer ; and the manufacturer who has not subdivided his original bill of material in such a manner as to enable him to readily substitute one device for the other will often make himself appear ridiculous by the large variation that exists between the figures submitted by him, and that submitted by a more conservative manufacturer who has made it a point to subdivide his bill of material. This applies more particularly to trucks, roofs, doors, brakes, draw gears, etc. Therefore the following general suggestions in regard to compiling estimates and filing records are offered :

Upon receipt of a request for figures on equipment by the

General Manager, an exact copy of the same, with all information, should be forwarded immediately to the engineering or estimating department. As soon as the communication is received by the estimator he should carefully read same, noting any special changes or alterations in the figures that may be mentioned other than is shown on drawings or mentioned in specifications. He should then read the specifications critically, noting on a blank adapted for that purpose special materials on which he requires quotations, and compare the specifications with the drawings to see that nothing is omitted. He should then communicate immediately with the Purchasing Agent, giving him all information necessary for him to secure intelligent bids on the materials required, not overlooking the essential feature of stating the approximate date of delivery. Having completed his request upon the Purchasing Agent, giving him all the time possible in which to avail himself of the best market prices from the most responsible manufacturers, the engineer or estimator should then proceed to make a complete detailed bill of all materials shown on the drawings or called for in the specifications, or that may be necessary for the construction of the car, whether or not they are shown on the drawings or specified.

The forms which are shown on pages 461–499 have been found most practicable for this purpose. That no materials may be omitted a regular system of accomplishing this work must be adopted. Bills of material for the various cars shown herewith are presented as a sample of what is considered the correct method to follow.

Too much cannot be said regarding the matter of details, nor can too much importance be given to the subdivision of the various fundamental parts involved in a complete estimate. While this method consumes a little more time, it is more than offset by the advantage of allowing the substitution of one device for another, with much less liability of error. Having completed and summarized the detailed bill of materials, the question of labor should be taken up with the head of each department. There is no rule by which this can be computed, as the location of the plant and equipment facilities materially affects this important question. But by care-

ful investigation it is found that the method of figuring labor in various shops differs very widely. Therefore the following suggestions are submitted as to the method of procedure:

IRON DEPARTMENT LABOR.

In some shops the iron department labor is computed upon the basis of a certain amount per cwt., which figure has been obtained by experience. This method, however, is not generally approved, as there is a possibility for large discrepancies, even though the experience has extended over a long period and covers a large variety of work.

A number of shops in this country do this work by contract, that is, the company supplies the power, keeps the machinery in repair and pays the contractor so much per car, or so much per cwt. for finished forgings. This method, however, has been condemned by most of the large manufucturers for the reason that the machinery has been abused and the necessary repairs have been neglected, or that the contractor has taken advantage of his privileges and charged labor for repairs instead of to his contract; and not a few instances have occurred wherein the contractor, being allowed to employ and pay his own help, has absconded with the wages of the employees.

Then again, said method does not give the manufacturer the control of his labor that he properly should have.

The most accurate results, however, are undoubtedly obtained by figuring piece-work price on each individual forging, the total of which gives the correct amount of piece-work per car, to this should be added a percentage to cover repairs and other labor charges which cannot be strictly charged to any particular forging. This percentage would, of course, be materially different in the various shops, according to equipment and facilities for handling materials. It can in each case be readily computed, as the foreman in charge can closely estimate the number of employees required in his department for such purposes, and compute at their rate of pay what would be expended for any certain purpose, and thus obtain the correct percentage of the piece-work.

LUMBER YARD LABOR.

The labor in the lumber yard is very easily computed on

the basis of so much per thousand feet for handling, inspecting and delivering the material to the dry-kiln or planing-mill, as the case may be.

This may be treated as so much labor or added to the cost of the lumber. The latter presents some advantages over the former, as it places the debit or credit against the lumber stock to run out in the inventory.

PLANING MILL LABOR.

It is somewhat more difficult to estimate the labor in the planing mill than the lumber yard, as the expense for mill work depends entirely upon the manner in which the lumber is received, and the facilities for handling the work. Some manufacturers contract the work at so much per thousand feet of material used in a car. Other manufacturers pay the foreman a salary, who in turn subdivides the work, paying each machine gang so much per finished car for the amount of material turned out by that particular machine. Others subdivide it by paying so much per finished piece. In this case the foreman would contract with his employees for one or more pieces per car, according to what he is able to successfully handle.

The more satisfactory results, however, are obtained by comparison of previous cost sheets for similar cars.

ERECTING SHOP LABOR.

The labor in the erecting shop is probably more difficult to estimate than either of the foregoing departments.

In this department many shops use what is known as class work, which is considered by many to be the most practicable. It certainly presents advantages over other systems in so far as cheap labor can be used for the rougher classes of work, and it affords an opportunity to educate car builders, as for instance, a man who has been working on bottoms will soon be able to lay floors successfully and from that to framing, then to siding and roofing. Again it separates the labor and prevents difficulties that are liable to occur if the erecting shop employees are all of one class.

If the class system is used it is much easier to estimate the labor than is possible when the car is built complete by

one gang; as by the latter system an accurate estimate can only be made by comparison with previous cost sheets.

PAINT DEPARTMENT LABOR.

The system of computing labor in this department does not materially differ from the foregoing, except that in some shops the work is done by contract, the contractor furnishing all the material, labor and tools, or the labor only; while in other shops a foreman is employed who hires assistance either on piece work, or day rate basis. Advantages are claimed for either system. Better results are, however, accomplished when the manufacturer supplies the materials and tools instead of the contractor.

The most accurate estimates are arrived at by computing labor for this department at so much per coat of paint for an ordinary 34-foot car, and proportionately increasing this amount for all extras, such as painting mortises, tenons, tops of sills, between roofing boards, outside of car frame, etc.; also lettering and other decoration, which should be computed at so much per letter according to size or style specified.

PATTERN DEPARTMENT LABOR.

In compiling estimates on freight equipment the estimator should not overlook the important item of patterns, templates, formers and dies. While the aggregate amount involved to cover these items is proportionately small when prorated over a lot of five hundred or one thousand cars, it requires practically the same amount to cover these items when there is but one hundred cars under consideration, it is very essential that it should be included.

There is no fixed rule for computing the amount involved in preparing the patterns, templates, formers and dies, as most manufacturers use previously made patterns, templates, formers and dies by making the necessary alterations to make them applicable, while other manufacturers make entirely new patterns, templates, formers and dies.

In either event the estimator should consult with the foreman of the Pattern Department, and also of the Iron Department, to ascertain from them what patterns, templates, formers and dies there may be in stock that are applicable to the cars under consideration, and make careful detailed esti-

mates of the additional patterns, formers and dies that might be required.

The Pattern Department and template makers' expenses are sometimes included in the general expense account, and are therefore not considered in making detailed estimates.

It is of quite as much importance that the labor in all departments be subdivided, as is the case in regard to the material, and the estimator or engineer should insist upon such subdivisions as will enable him to estimate the labor involved in the use of any particular device entering into the construction of the car.

GENERAL EXPENSE

The question of general expense is a very serious one; however, it gives the average estimator little concern because it is usually computed by the accountant on a percentage basis, or is made a fixed charge. This important question, however, must be decided upon by the General Manager. The difficulty of determining the correct percentage is increased by the varied conditions connected with manufacturing, and by the relation the establishment charges (commonly called general labor or general expense) bear during any given period to the actual construction charges, and by considerations or policy which may determine the minimum amount of work which must be obtained for the factory, even at a sacrifice of profit.

Very brief consideration will show that this complicated problem requires something more than ill-considered estimates or arbitrary percentages to serve the purpose, and a properly organized accounting department will keep a detailed labor account showing the cost of all work performed, and this data, when carefully worked out, forms the most reliable basis for future percentages. Indeed, one of the principal services to which the figures of accountants can be applied is that of estimating. Unfortunately most managers do not allow the estimator to have copies of cost sheets.

Whether it would not be wiser to treat the engineer or estimator with greater confidence and place before him in graphic form the results of his good or poor estimating, is a

question that must be left for the managers to decide for themselves. However, when they determine to ask their engineer or estimator to prepare costs without access to the results of previous estimates, they should at least check the new calculations by the ascertained figures for previous work.

It must be admitted by the average General Manager that the engineer or estimator is, in a large measure, responsible for the successful operation of his plant, as upon the correct compilation of figures upon which he bases his bid for cars depends his success in securing the contracts at a reasonable figure, thus enabling him to operate his plant successfully.

There are many estimators who claim to understand estimating in all its details, whose ability in a practical way is limited to theory only. A competent estimator must have had a thorough technical education, and a thorough practical experience in freight car construction. There are many details in connection with the compiling of estimates which require practical as well as theoretical knowledge.

This fact is illustrated by the large variation in the figures submitted by the various manufacturers. Instances are not infrequent wherein a variation of from $25.00 to $50.00 per car is shown between the lowest and highest bid. Such variations are accounted for by the fact that some engineers in charge of estimating do not thoroughly understand all the details in connection therewith.

In consequence of not having decided what materials should be used for various parts of the car, railroad companies quite often omit from their drawings and specifications certain materials, and an exaggerated instance of incorrect estimating is recalled by the writer wherein the couplers were omitted from the figures, because they were neither shown on the drawing or specified.

It is a fact that too much economy is exercised in this particular direction. Foremen, clerks, and other employees of car factories and railroad shops are often paid higher salaries than that of the estimator, who has much more responsibility, and to a certain extent is responsible for the successful operation of the plant; he should therefore receive just compensation for his experience and ability.

An exaggerated figure submitted as the cost for five hundred cars or more will certainly lose for the factory one or more months of steady employment, while on the other hand, an estimate which is too low would result in the operation of the works for one or more months at a considerable loss.

Construction in all its details should be under the supervision of the engineer or estimator, at least in so far as the distribution of the labor and materials are concerned. Instances are known where cars have been completed, and the cost compiled by an accountant who was not familiar with the construction, and important items have been omitted, thus showing a fictitious profit, which resulted at the end of the year, when the inventory was taken, in a large deficit in the material account. It is therefore suggested that at the completion of all contracts, the cost, including all materials and labor, be submitted to and approved by the estimator before being submitted to the General Manager, thus assuring the General Manager that the cost, whatever the result may be, is correct.

It should be particularly noted that all comparisons and estimates herein presented are based upon the actual quantity of material required for the purpose intended, thus giving the only correct comparison.

However, allowances should be made in each of the various bills to cover rejected materials, breakage, etc. This amount is an unknown quantity, as the conditions prevailing in various shops would materially affect any figure that can be presented. It is therefore thought best to deal separately with the various materials, same being divided under the following heads: Lumber, Castings, Wrought Iron and Miscellaneous Materials.

LUMBER.

It is probably more difficult to estimate the exact quantity of lumber required for the construction of a freight car than any other material entering into its construction. This is due to many reasons, the principal of which are the amount that should be allowed for culls in receiving the material, rejections after the material has been worked, and the quantity spoiled by the workmen.

Some manufacturers allow a fixed percentage of the vari-

ous kinds of lumber for this purpose, while others add a lump sum. With the larger timbers, such as sills, it is quite an easy matter to determine the amount to be allowed for rejects, whereas with sheathing and the finer grades of lumber it is more difficult. However, experience shows it necessary to add 2½% to 3% of the actual amount of lumber required to cover these items, the exact amount depending upon the conditions prevailing in the different shops. One manufacturer will purchase and use materials of a much better grade for the same purpose than another, in which case the percentage of rejects is much less. This question is, therefore, left for the manufacturer to decide after he has considered the conditions in connection therewith.

Another and very important matter is the question of what is merchantable sizes of lumber. Specifications often call for lumber to finish certain widths, an economical rough size of which it is impossible to purchase, thus necessitating the purchase of a much larger size, thereby causing excessive waste. Roofing, lining, and sheathing are oftentimes specified to finish with 4, 6, or 8" face which would necessitate the purchase of the merchantable size, larger than which it is specified to finish. The lengths of lumber are also often specified to finish but a few inches over what is merchantable lengths, which also necessitates the purchase of the next longer length. To illustrate, a piece of white, yellow or Norway pine sheathing is specified to finish 14' 2", in which case 16' 0" would have to be purchased. The merchantable widths and lengths commonly used in freight car construction are

1 x 4, 6, 8, 10 and 12" x 12, 14, 16 and 18'
2 x 4, 6, 8, 10 and 12" x 12, 14, 16 and 18'

and the estimator should confine himself to these sizes and lengths except in special cases, such as white pine for double board roof, which can be purchased in 5' 0" or 10' 0" lengths, and flooring which can be purchased in 9' 0" or 18' 0" lengths.

White or Norway pine being specified to finish 1⅛" or 1¼" in thickness, necessitates the purchase of 2" material. This also applies to the width, which is often specified to finish 6", thus necessitating the purchase of the 8" width.

Small quantities of odd sizes are at all times obtainable in certain localities, but the estimator should confine himself to

the merchantable sizes and lengths, unless he has ascertained from the lumber agent that sufficient quantity of the size which he might require is obtainable in the time specified.

It is very essential that the estimator should consult the lumber agent with regard to the correct interpretation of the Railroad Company's specifications (which are very often ambiguous and contradictory), as suggestions are often made and accepted by the Railroad Company, thus preventing any further consideration as to sizes and the correct interpretation of the Railroad Company's requirements.

It is suggested that all lumber delivered by the lumber department be charged to the cars under construction, and credit be given the cars for such lumber as may have been rejected, at a price to be determined by the lumber agent (who is better able to determine what value can be realized by its use for other purposes), thus allowing the cars under construction to stand the expense of the rejects.

By keeping accurate accounts of this important department, the manufacturer should be able, after the construction of a few lots of cars to determine approximately what percentages should be allowed for rejects.

CASTINGS.

The actual quantity of castings required for any particular car can only be obtained by previously having made the patterns and castings, thus obtaining the actual weights, which are usually furnished with the railroad company's specifications and drawings. In some cases, however, the railroad companies do not furnish detailed weights of castings, in which event it is necessary to carefully estimate the weight from detailed drawings of the castings. This is often difficult to accomplish, owing to the irregular shape of the castings, but the method of procedure would be to average the thickness, length and breadth of the castings thereby getting its cubical contents; reduce this to inches and multiply by .26, which should give approximately the weight of the castings. However, for close estimating this is hardly reliable enough. If the railroad company does not give the weights of castings or detailed drawings, it becomes necessary for the estimator to

assume the weight of the castings, basing his assumption upon what he knows to be the weight of similar castings. It is suggested, however, that in all cases the estimator should state upon what basis the weights of the castings have been computed, whether as shown on the railroad company's drawings and specifications, figured from detailed drawings, or assumed from similar castings previously used.

WROUGHT IRON.

To figure correctly the exact amount of wrought iron required is also quite a difficult task. First, because the various rolling mills cause a variation in the weight of bar iron by rolling the sizes a trifle full or a trifle light. Two per cent. variation, however, is allowed in merchantable iron to cover this item.

Probably the most serious question in connection with figuring the exact quantity of iron required, is the different methods employed by the Iron Department foreman in the manufacture of the various forgings, some using much more area by cutting or punching out irregular shapes, while other foremen exercise more economy by drawing and forming holes rather than cutting material away. It is therefore suggested that the estimator consult freely with the Iron Department foreman in regard to what method will be used for the production of the various forgings, with the manufacture of which he is not thoroughly familiar. With the modern upsetting machines which we now have, a great saving is oftimes made over the old method of hand work.

Another and still more important question, which seriously affects the actual quantity required, is the allowance to be made for breakage and spoiled parts, which are liable, and do occur even in the best regulated shops. This is again an unknown quantity and can not be accurately estimated. However, many of the foremost manufacturers consider that the scrap accumulating from the manufacture of the various forgings about offsets the extra quantity over and above the actual amount required; while others allow a certain percentage for such purposes, and then credit the estimate or contract with the estimated accumulation of scrap. The former method allows very liberally for this purpose, but could not

possibly be used if the forgings were manufactured to be sold by the pound, and is only applicable to contract work including the entire car.

The estimator will find very complete tables covering the weights per cubic foot and per lineal foot of the various sizes of iron required, but to make him independent of reference to any table, the following method is presented, and after he becomes accustomed to its use he can work more rapidly and reference to the tables will be absolutely unnecessary. The weight of iron varies considerably according to its density, which is affected by the size of the bars, but is generally understood and figured to weigh 480 lbs. per cubic foot; thus a bar 12 x 12 x 12 inches weighs 480 lbs.; a bar 1 x 12 x 12 inches would weigh 40 lbs. and a bar 1 x 1 x 12 inches would weigh 3⅓ lbs. To ascertain the weight of any particular size multiply the number of pieces by the width in inches, by the thickness in inches, and the length in feet which gives the area, and then by 10/3, which gives the total weight. To illustrate: 4 pieces 4" x 1¼" x 6' 3" would weigh 4 x 4 x 5/4 x 75/12 x 10/3 = 1250/3 = 417 lbs.

With round sections, however, it is somewhat more difficult, and the method of proceedure would be as follows: Square the diameter, multiply by .7854, this by the length in feet, which gives the area multiplied by 3⅓ or 10/3 the total weight. For example:

2 pieces 2" round 14" long. 2 x 2 = 4 x 2 x 14/12 x 10/3 x .7854 = 24.324 lbs.

This latter method, however, is not considered expedient enough for general practice, and the following suggestion is offered in regard to round iron. As a rule the sizes of round iron for ordinary car construction varies from ¼" to 2", thus giving but a comparatively few sizes, which the estimator can easily commit to memory; and to better enable him to do so the following abbreviated weights have by experience proven approximately correct, although it should be noted that they vary slightly from the actual weights based on 480 lbs. per cubic foot. On the other hand it should be noted that while some are slightly over actual weight, the others are proportionately less, and practice has shown that they approximately equalize when extended over any considerable period:

¼"	.163 lbs.	1⅛"	3.35 lbs.
⅜"	.37 "	1¼"	4. "
½"	.667 "	1⅜"	5. "
⅝"	1. "	1½"	5.95 "
¾"	1.5 "	1⅝"	7. "
⅞"	2. "	1¾"	8.1 "
1"	2.65 "	2"	10.5 "

As previously stated these weights can be easily committed to memory, adopting as nearly as possible even decimals, it also establishes a quick and ready method of figuring blank weights of bolts. The larger portion of the bolts in a modern freight car are ⅝, ¾ or ⅞" usually requiring some aliquot part of 12 per car. Thus if we have 8 ¾" bolts 17⅜ long, with ¾" iron at 1½ lbs. per ft. the bolts would weigh 17⅜ lbs. or the length shown. If the same bolts were ⅞" in diamter they would weigh the length, 17⅜ plus ⅓ or 23 lbs. nearly. Whereas if the bolts in question were ⅝" in diameter the weight would equal the length less ⅓ or 12 lbs. nearly.

This explanation is made merely that the estimator may avail himself of a quick and ready method by which to figure the large number of different lengths of bolts as shown in detailed bills of material.

MISCELLANEOUS MATERIALS.

Under this latter division there should be no serious difficulty in computing the quantities of the various materials required, except possibly nails, nuts and washers. After a careful examination of the different lists supplied by the various manufacturers, a selection has been made which is considered just, and upon which the estimator can safely base his calculations.

Nearly all railroad specifications specify the number of nails required to each piece, and where they do not the estimator should follow what is common practice; in either case he would necessarily be compelled to count the number of nails required, after which reference could be made to the accompanying table, thus enabling him to determine the exact quantity of nails actually required to build the car. It is a well known fact, however, that even in the most disciplined shops nails of the various sizes are lost and wasted; it thereby

becomes necessary for the estimator to consider this matter in compiling his estimates, and allow what experience has taught him to be the correct quantity, either by adding a proportionate amount of each size or a total quantity at the average price.

The number of nuts and washers required is easily determined, and when making the detailed bill of material the estimator should add to each bolt the number of nuts and washers required for each, and upon completing the bill of material they can be counted up and the number included under the various sizes.

It is easy to determine the weight of washers from the accompanying table, which is furnished by one of the most reliable manufacturers. With nuts, however, it is quite different, and the method of computing the weights of same is dependent entirely upon the system of tapping nuts that is in effect in the shop. Many manufacturers purchase their nuts in large quantities and issue special instructions for tapping, allowing the cost to be charged against the nuts, while other manufacturers allow the cost to be charged direct to the cars under construction; then again, others purchase their nuts already tapped. If the shop has the proper facilities the former method is recommended, as it allows more nuts to be tapped than may be actually required for any particular job. If this method is adopted, however, the estimator should not overlook the very important item of shrinkage from untapped to tapped nuts, which weight varies from 6½% to 8%, according to the size; this, together with other losses, the manufacturer usually figures at 10%. This shrinkage must be provided for either in the price furnished for tapped nuts or in computing the weight of the blank nuts. Therefore tables are presented from the most reliable manufacturers for the weights of both blank and tapped nuts.

The estimator should guard closely against making serious mistakes in interpreting the specifications for special materials, as the railroad companies have adopted a custom of furnishing a large portion of the special materials f. o. b. the works of the contractor. He should also be positive that the quotations furnished him are either *f. o. b.* the factory or that the *freight rate*, which is very often an important item, is included.

It should be especially noted that no quantities are enumerated under the head of "Paint Materials" in the accompanying bills of material, these being consolidated, as the conditions prevailing in the different locations would affect any quantity that could be presented.

The dimensions and weights of axles are usually furnished in the Railroad Company's specifications. If this is not the case, however, it becomes necessary for the estimator to figure the weight of same, which is done by adding ¼ to the finished sizes for loss in turning. A table is presented giving the exact weights of a large variety of sizes which will be found of assistance to the estimator in determining the weight of the axles specified.

We also include tables showing standard galvanized sheet and plate iron price list, guage and weight per square foot in both ounces and pounds, and thickness in inches, all as adopted by Congress and approved March 3rd, 1893; and to facilitate the matter of arriving at the net cost of same, a table is presented showing almost every conceivable trade discount.

SWITCHING AND DELIVERY OF CARS.

The question of switching and delivery of materials and new cars should not be overlooked by the estimator, as these are important items of the aggregate total.

ROYALTIES.

The question of royalty is one that demands more than passing attention from the estimator, as the right to use many of the important patent devices entering into modern freight car construction has been purchased by a lage number of railroad companies, in which case no royalty should be included for the use of the device, but on the other hand, in cases where such rights have not been purchased by the railroad company, the estimator should not neglect to include in his estimate the amount of royalty per car, all of which information can be obtained by having the Purchasing Agent communicate with the patentee or manufacturer of the devices in question.

The question of handling, filing and compiling estimates is one of more than ordinary importance, and demands the closest attention of the engineer or estimator in charge of

the department, as ready reference to any former figures that may have been compiled for similar equipment form the basis of the most valuable information from which comparison of material and labor can be made.

The system in force in the various plants differs very materially, but from close observation it has been found that the following description covers in a general way a system which is very practicable and not too expensive.

Immediately upon receipt of a request for figures on a lot of cars, index the request in a book especially for that purpose, giving the name of the road in full, number, capacity and general description of cars required. Then give the request a file number beginning with 1 and sub-dividing into letters, as 1 A would indicate a request for figures on five hundred cars for the New York Central & Hudson River Railroad; 1 B would indicate a request for figures on five hundred cars for the Lake Shore & Michigan Southern Railroad.

The numerals should indicate the number of drawers arranged in cabinet form, 10 x 16 x 3 inches inside, and the letters should include a strong manilla envelope of such size as could conveniently be used in connection with the drawers, say 9 x 15. Each drawer is of such depth as will hold from 8 to 15 of these envelopes, according to the amount of correspondence.

Immediately after indexing, the engineer or estimator should mark very plainly on the top of the request 1 A or 1 B, as the case may be, and all papers coming to his notice and bearing upon any particular subject must be plainly marked before allowing it to go into general use, thus assuring its being filed in the proper envelope.

A similar index should be adopted for the use of pamphlets and catalogues, which are required for reference, and for this purpose it is suggested that a cabinet be adopted, having large drawers which are partitioned into various sizes that may be necessary to accommodate the catalogues, and index in the same manner except that instead of making an envelope, a small Denison tag should be pasted in a conspicuous place on the front cover of the catalogue or pamphlet.

It should be the express duty of the engineer or estimator in charge of an office to see that all papers are filed regularly

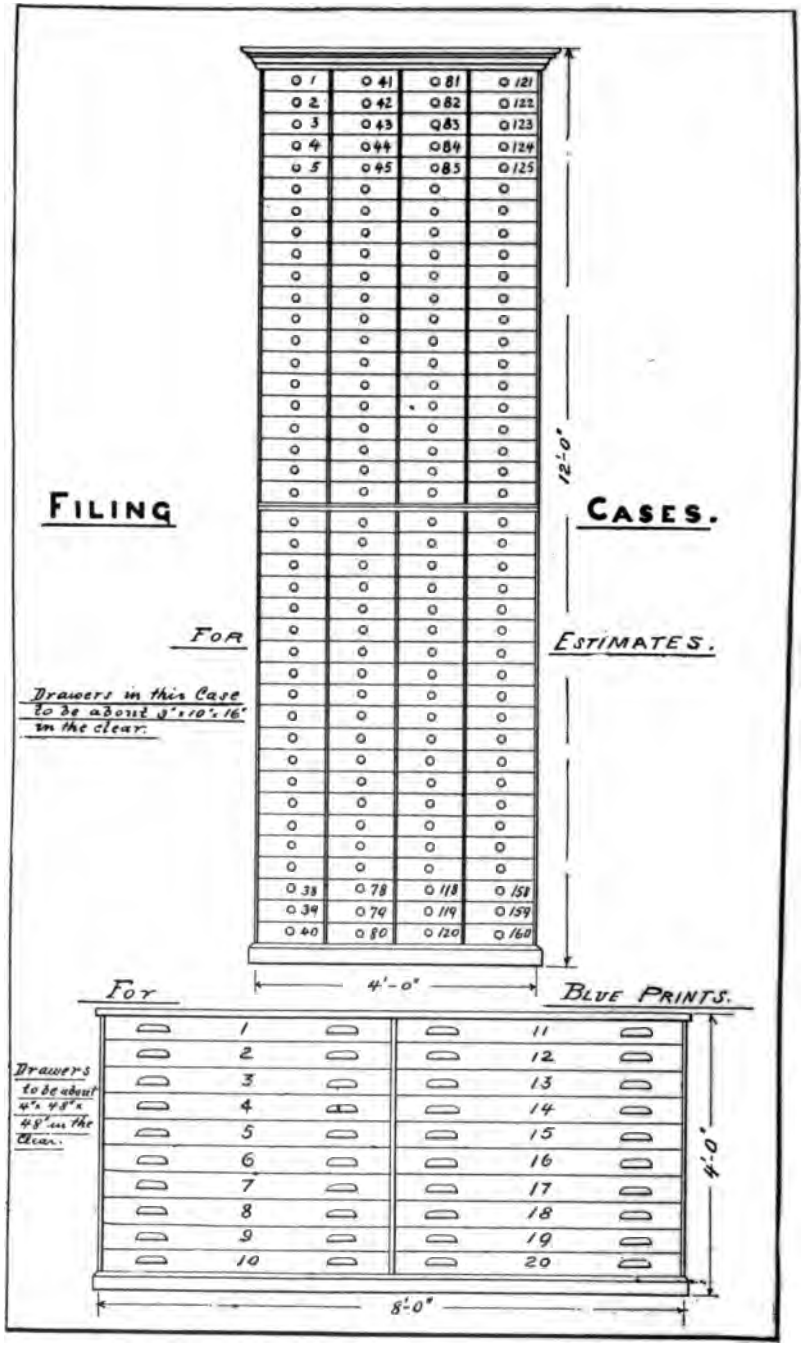
each night, thus reducing the liability of serious delays in consequence of not being able to readily find any particular paper he may require.

These cabinets can be made of white pine or poplar, and the expense thus incurred is more than offset by the time saved in referring to the various papers necessary for compiling or comparing an estimate.

To better enable the reader to understand the explanation, a sketch is herewith submitted, showing the suggested design for the above described estimates and catalogues.

It should also be noted that this same system, with but slight modifications, can be readily adopted for filing blue prints and tracings.

It is suggested that the cabinet for the filing of estimates be of such size as would accommodate, say 150 drawers, which could be made in two sections, for convenience in handling.


FILING CASES.
FOR ESTIMATES.
Drawers in this Case to be about 9"x10"x16" in the clear.
12'-0"
4'-0"
FOR BLUE PRINTS.
Drawers to be about 4"x 48"x 48" in the clear.
4'-0"
8'-0"

CHAPTER II.

FREIGHT CAR TRUCKS.

There are two general classifications of Freight Car Trucks, namely:

I. *Rigid trucks*, which may be subdivided into:
   (a) Diamond Trucks,
   (b) Shaped Metal Trucks.

II. *Swing Motion Trucks*, of which there are:
   (a) Such carrying the bolster by pivoted hangers,
   (b) " " " " " rollers.

1. (a) *The "Rigid" Diamond Trucks* are now probably the most generally used type, and familiar to every railroad engineer in its varied designs. The truck shown on page 31 is not presented as a model, but represents a plain specimen of this type commonly used under 30 ton equipment, and upon which comparisons with other trucks are usually based.

Other trucks of this class are the Schoen Pressed Steel Diamond Truck and the American Cast Steel Truck.

All trucks under this class have the springs located under bolsters.

(b) *Rigid Shaped Metal Trucks* are rapidly gaining favor with railroad managers, and comparative figures are asked in almost all specifications for new equipment of the different styles of this class.

Considerable development of this type may be expected in the near future, but thus far only two designs have obtained prominence by demonstrating practical utility, and they are the Fox Pressed Steel Truck and the Schoen Pressed Steel Truck. A recent addition to this class is the Hewitt Rolled Steel Truck.

All trucks under this class have the springs located over the journal box, excepting the Buckeye Steel Truck, which has same under bolster supported by transoms and spring hangers.

II. (a) *All Swing Motion Trucks* under freight cars are of the Diamond type, differing principally in the arrangement of spring hangers and attachments.

(b) *The Roller Bearing Trucks* (Barber Patent) obtain swing motion without hangers, the bolsters being supported by cylindrical steel rollers, the object of this form being to combine the best features of the rigid and swing motion trucks.

The following comparisons and illustrations have the express purpose of readily determining the actual differences between the cost of one or the other of these trucks.

To compare all of the various trucks which are now in use would far transcend the limit of our space, as many of the standards now adopted by the principal railroad systems of this country differ only in details.

There are in use to-day, excepting a very few instances, but three capacities of cars, namely 20, 25 and 30 tons, but the increased competition in handling freight necessitating larger capacity cars, the 20 and 25 ton cars are practically abandoned; and even now there is considerable discussion as to the practicability of the 40 ton or larger capacity cars. Since these latter have not come into general use, however, the comparison of the various trucks presented herewith are based on the design of a 30 ton car.

Below are given such notes as are directly applicable to the various Trucks presented:

30 Ton Rigid Truck: Bolsters are frequently sandwiched with iron plates or "I" beams instead of truss rods, and often in addition to the latter the wooden bolster is sometimes replaced by pressed steel bolsters (Schoen Pressed Steel Co.) or cast steel bolsters (supplied by the various cast steel foundries.)

Spring planks are often made of channel or pressed steel shapes (Schoen Pressed Steel Co.) instead of wood, principally to facilitate the application of inside hung brakes and reduction of dead weight.

Schoen Pressed Steel Diamond Truck: This truck differs from the ordinary rigid truck principally on account of the exclusive use of metal in its construction, and that the springs are carried by transoms and spring hangers instead of spring

planks. It permits the use of the M. C. B. standard journal box without alteration.

The American Cast Steel Truck: This is a Rigid Diamond Truck with cast steel bolsters and cast steel combination column and spring seat, but without spring plank, which latter is substituted by two diagonal cross-tie bars, the idea being to reduce the weight and number of parts to a minimum.

Fox Pressed Steel Truck Frame: Most car-builders and railroad men are familiar with this truck. The principle features are the exclusive use of steel and the change in the location of springs from under bolster to top of journal box, necessitating a change in the latter.

It should be noted that the accompanying illustration is an exact reproduction of the latest design, also that the bill of materials include cast iron spring caps, and side bearings with the necessary bolts, and that body center plates are included as being furnished with truck frames.

Schoen Pressed Steel Truck Frame: Like the Fox, this truck is also well known to the car-builders and railroad men, and the accompanying cuts show very plainly the original features of the latest design.

Contrary to the Fox Truck, the spring caps and side bearings are of pressed steel, riveted to truck frame and furnished with same. The body center plates, however, are not furnished with the truck frames unless required, in which case they are to be considered as an extra.

Hewitt Rolled Steel Truck: The features of this truck are the use of specially rolled shapes for side and crossed frames, and the arrangement of the pedestals in such a manner as to facilitate the exchange of wheels and axles under cars. The springs are located on top of the journal box.

Buckeye Steel Truck: This truck is built of structural steel and has been in use for a number of years under locomotive tenders, but has not yet come into general use for freight cars.

Attention is called to the Elliptic springs shown in the illustration, which under freight cars would not be a necessity.

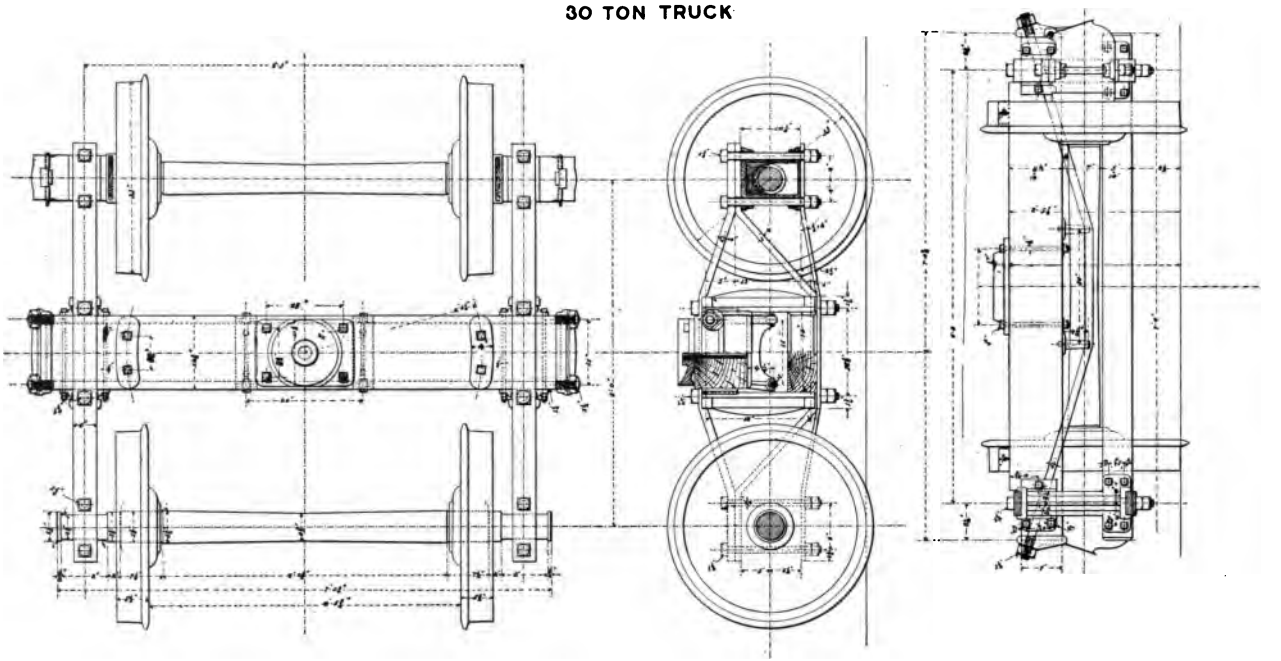
30 Ton Swing Motion Truck: Bolsters are frequently

trussed with rods instead of sandwich plates, and sometimes both are used, as with the rigid truck pressed or cast steel are sometimes substituted for the above.

Transoms are often made of channel instead of wood to save weight and space necessary for the application of inside brakes. Then again some railroads have converted their swing motion trucks into rigid trucks by bolting or riveting the spring hangers to transoms.

30 Ton Roller Bearing Truck: Usually a compound bolster of wood and metal is applied to this truck; however, pressed or cast steel specially designed are sometimes substituted.

30 TON TRUCK



COMPLETE BILL OF MATERIALS FOR ONE SET OF RIGID 30-TON TRUCKS.

Cut No. 1.

GENERAL DIMENSIONS.

Wheel base	5′ 0″
Center to center of journals	6 3
Spread of arch bars	1 6
Top of rail to top of bolster	2 5½

Arranged for outside hung brakes.

LUMBER :

Pcs.	Description.	Material	Finished Size.	Rough Size.	B. M.
2	Bolsters	Oak	9 ″ x12½″x 7′ 4⅛″	9¼″x12¾″x 7′ 6″	148′
2	Spring planks	“	5 x14 x 7 4	5¼ x14¼ x 7 6	94
8	Dust-guards	Basswood.	1 1/16 x 7⅜ x 10¼	1 x 8 x 1 0	5
					247′

CASTINGS :

Pcs.	Patterns.	Description.	Material.	Wt.
		Truck Frames, etc. :		
8		Journal boxes, 4¼″x8″ Journal	Gray Iron	696
8		“ “ wedges	“ “	80
8		Truck bolster guide bars	“ “	312
				1088
		Bolster :		
4		Truck side bearings	Gray Iron	50
2		“ center plates	“ “	134
8		Bolster guide bar blocks	“ “	64
4		“ truss-rod bearings	“ “	56
				304
4		“ “ washers	Malleable Iron.	42
			Total Gray Iron	1392
			“ Mall. Iron	42

30 TON RIGID TRUCKS.—Continued.

FORGINGS.

C. W	W. W.	Nuts	Pcs.	Description.	Size of Blank.	Weight
				Truck Frames, etc.:		
			4	Arch bars, 5" set	4 "x 1¼" x 6' 3½"	420
			4	" " inverted 13" set	4 x 1 x 7 0	373
			4	Tie bars, 2¾" set	4 x ⅝ x 6 1½	204
						997
				Bolster:		
		2	4	Bolster truss rods, upset 1½" x 3"	1¼" x 8' 2½"	134
					Total Forgings	1131

BOLTS.

C. W.	W. W	Nuts.	Pcs.	Description.	Size of Blank.	Weight
				Truck Frame, etc.:		
		2	8	Bolster guide bar bolts	1¼" x 2' 2¾"	72
		2	16	Journal box bolts	1⅛ x 1 6¼	81
Cot			8	Journal box lids, B. H.	⅝ x 0 9	6
						159
				Bolster:		
	1	1	8	Center plate bolts	¾" x 1' ¾"	13
	1	1	8	Side bearing bolts	⅝ x 1 ¼	9
		2	12	Column guide and bolster	⅝ x 1 5	17
						39
				Spring Plank:		
		2	16	Column and spring plank	⅝" x 1' 6⅞"	26
					Total Bolts	224
					Summary:	
					Truck Frame, etc.	1156
					Bolster	173
					Spring Plank	26
					Total Wrought Iron	1355

MISCELLANEOUS MATERIALS.

Per Car	Description.	Size	Weight
8	Wheels, 33" diam., 600 lbs, each, M. C. B. Std. tread, guarantee and test; 5" core		
8	Journal bearings, brass, lead lined, M. C. B Std., 30 ton		100
4	Axles, No. 1 Wro't scrap or muck bar, M.C.B. Std., 30 ton		1968
8 gals.	Car Oil		
	Cotton Waste		14
4 nests.	Bolster springs, Penna. "W" pattern, complete; 1⅛" coil; 7½" free over plates		
8	Journal box lids, M. C. B. Std., pressed steel		
8	Spring cotters for box lid hinge bolts	3/16" x 1¼"	
	Paint Materials		

(Continued)

30-TON RIGID TRUCKS—(Continued.)

MISCELLANEOUS MATERIALS—(CONTINUED.)

Per Car.	Description.	Size.	Weight.
	NUTS AND WASHERS:		
	Truck Frame:		
16	U. S. Standard Square Nuts	For 1¼" bolt,	16
32	" " " "	" 1⅛ "	24
	Bolster:		40
8	U. S. Standard Square Nuts	For 1½" bolt	13
8	" " " "	" ¾ "	2
32	" " " "	" ⅝ "	5
	Spring Plank:		20
32	U. S. Standard Square Nuts	For ⅝" "	5
	Bolster:	Total Nuts	65
8	Wrought Washers	For ¾" bolt	1
8	" "	" ⅝ "	1
		Total Washers	2

SUMMARY:

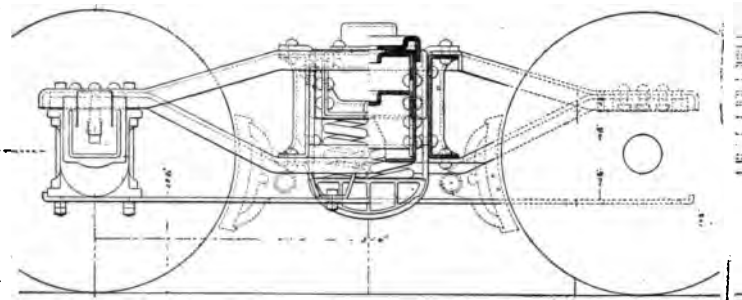
Quantity.	Specifications.	Price.	Amount.
242 feet.	Lumber, white oak		
5 "	" basswood		
1392 lbs.	Castings, gray iron		
42 "	" malleable		
1355 "	Wrought iron		
65 "	Square nuts		
2 "	Wrought washers		
8	Wheels, 33", 600 lbs		
1968 "	Axles, M. C. B., 60,000 lbs		
100 "	Journal bearings		
4 nests	Bolster springs		
8	Spring cotters		
14 lbs.	Waste		
8 gals.	Car oil		
8	Journal box lids		
	Paint materials		
	Labor.		
	Lumber yard		
	Mill		
	Blacksmith		
	Bolt room		
	Iron machine		
	Fitting wheels and axles		
	Truck builders		
	Painters		
	General labor		
	" expense		
	RECAPITULATION:		
	Materials		
	Labor		
	General expense		

COMPANY.

ESTIMATED ..... 18.....

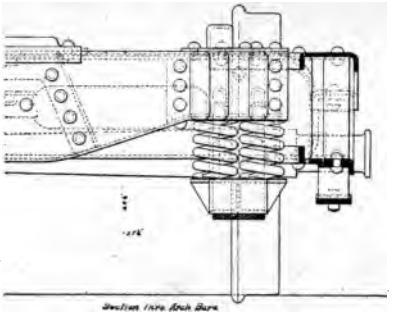
For accoun

SPECIFICATION.	Brakes	Brake Beams				Remarks
	Amount	Quantity	Amount			
Lumber—Oak						
Basswood						
Castings—Gray Iron						
" Malleable						
" Steel						
Wrought Iron						
Scrap						
Metals						
Nuts—Square						
" Hexagon						
Wrought Washers						
Nails						
Wheels						
Axles						
Journal Bearings						
Springs—Equalizers						
" Elliptic						
" Bolsters						
General Merchandise						
Cotters						
Turnbuckles						
Screws						
Chain						
Waste						
Oil						
Channels						
Dustguards						
Journal Box Lids						
Brake Beams						
Paint Materials						
Freight—Express						
Labor—Lumber Yard						
Mill						
Blacksmith						
Bolt Room						
Iron Machine						
Fitting Wh'ls & Axl						
Truck Builder						
Painter						
Gen'l Labor						
" Expense						
Royalties						
Recapitulation						
Materials						
Labor						
General Expense						
Royalties						
Patterns...Temp						
Formers...Dies						
Delivery						

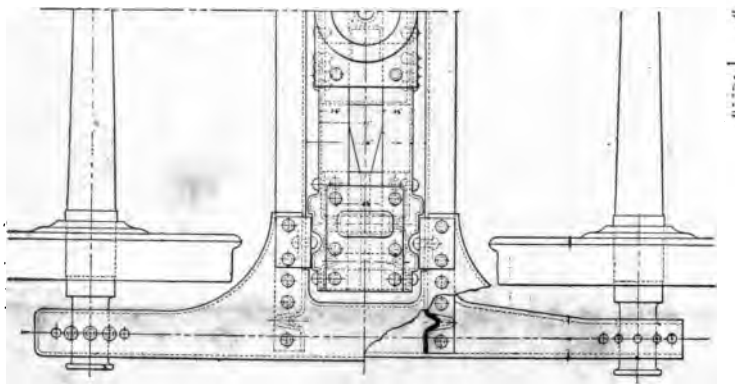


Side Elevation

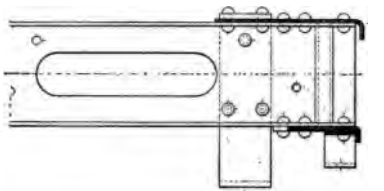
Section thro centre.



Section thro Axle Box.



Plan View



PRESSED STEEL DIAMOND TRUCK

COMPLETE BILL OF MATERIAL FOR SCHOEN PRESSED STEEL DIAMOND TRUCK.

GENERAL DIMENSIONS.

Wheel base	5′ 4″
Center to center of journals	6 3
Top of rails to top of bolster	2 4½

Arranged for outside hung brakes.

LUMBER.

Pcs.	Description.	Material.	Finished Size.	Rough Size.	B M.
8	Dust guards	Basswood.	11/16″x7⅜″x0′ 10¼″	1″x8″x1′ 0″	5′

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Wt.
8		Journal boxes, 4¼″x8″ journals.	Gray Iron	696
8		" " wedges	" "	80
4		Spring seats	" "	140
				916

FORGINGS AND BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			4	Tie bars	4 ″x⅝″x6′ 5 ″	214
		2	16	Journal box bolts	1⅛ x1 6¼	81
	Cot		8	" " lid hinge bolt, B. H.	⅝ x0 9	6
		1	8	Tie bar to truck frame	⅞ x0 4¼	6
						307

SCHOEN PRESSED STEEL DIAMOND TRUCK.

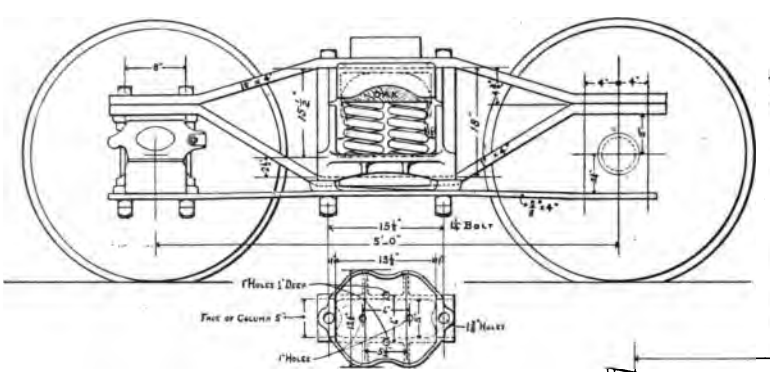
MISCELLANEOUS MATERIAL.

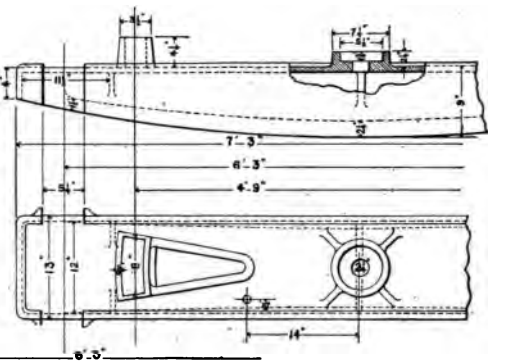
Per Car.	Description.	Size.	Weight.
	The Schoen Pressed Steel Diamond Truck Frames complete, including bolsters, with center plates, side bearings and bolster guide bar plates, all riveted to them, and the truck frame proper, which consists of the top arch bar, bottom arch bar, distance pieces between bottom arch bar and the bottom tie bar, the shaped spring stirrup, the cross transoms and malleable iron brake beam hanger brackets when inside brakes are required. All as supplied by the Schoen Pressed Steel Company, of Pittsburg, Pa.		
8	Wheels 33" 600lbs each, M.C.B., Std. tread, guarantee and test, 5" core	.....	.....
8	Journal bearings, brass, lead lined, M.C.B. Std. for 30 ton cars	.....	100
4	Axles, No. 1 wro't scrap or muck bar, M.C.B. Std. for 30 ton cars	.....	1968
8 gals.	Car oil	.....	.....
	Cotton waste	.....	14
4 nests.	Bolster springs, Penna. "W" pattern, complete with plates, 1⅛" coil, 7½" free over plates	.....	.....
8	Journal box lids, M.C.B. Std. pressed steel	.....	.....
8	Spring cotters, for box lid hinge bolts	3/16"x1¼"	.....
32	U. S. Std. square nuts	For 1⅛" bolt	24
8	" " " "	" ⅞" "	3
			27
	Paint materials	.....	.....

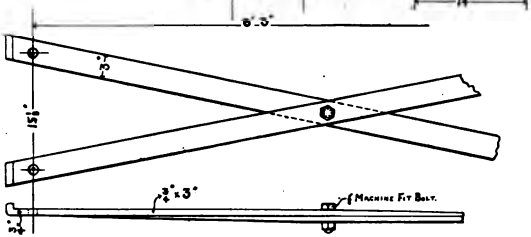
SCHOEN PRESSED STEEL DIAMOND TRUCK.

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
5	feet.	Lumber, basswood.....		
916	lbs.	Castings, gray iron.....		
307	"	Wrought iron.....		
27	"	Square nuts.....		
8		Wheels.....		
1968	"	Axles, iron, M. C. B., 60,000 lbs.		
100	"	Journal bearings.....		
4	nests.	Bolster springs.....		
8		Spring cotters		
14	lbs.	Cotton waste		
8	gals.	Car oil		
8		Journal box lids.....		
		Paint materials.		
		The Schoen pressed steel diam'd truck frame and truck bolster.		
		Labor :		
		Lumber yard.....		
		Mill.....		
		Blacksmith.		
		Bolt room		
		Iron machine.....		
		Fitting wheels and axles.....		
		Truck builder.....		
		Painter		
		General labor.		
		" expense		
		RECAPITULATION.		
		Materials.....		
		Labor		
		General expense.....		







AMERICAN · STEEL · TRUCK

American Steel Foundry Company,
Granite City, Ill.

COMPLETE BILL OF MATERIALS FOR ONE SET OF AMERICAN STEEL 30-TON TRUCKS.

GENERAL DIMENSIONS.

Wheel Base	5′ 0″
Center to Center of Journal	6 3
Spread of Arch-bars	1 6
Top of Rail to top of Bolster	2 5½

Arranged for Outside Hung Brakes.

LUMBER.

Pcs.	Description.	Material.	Finished Size.	Rough Size.	B. M.
8	Dust Guards	Basswood	11/16″x 7⅞″x10½″	1″ x 8″x1′ 0″	5′
4	Filling over Spring.	Oak	8 x12 x11½	8¼ x12¼x1′ 0	34
					39′

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Weight.
8		Journal Boxes, 4¼″x8″ Journal.	Gray Iron.	696
8		" " wedges	" "	80
				776

FORGINGS.

C. W.	W.W.	Nuts.	Pcs.	Description.	Size of Blank.	Weight.
			4	Arch Bars, 5″ set.	4″x1¼″x6′ 3½″	420
			4	" " 13 "	4 x1 x7 0	373
			4	Tie Bars, 2¾ "	4 x⅝ x6 1½	204
			4	Diagonal Tie Straps.	3 x¾ x7 1	213
						1210

AMERICAN STEEL TRUCKS—(Continued).

BOLTS.

C. W.	W.W.	Nuts.	Pcs.	Description.	Size of Blank.	Weight
		2	8	Bolster Guide-bar Bolts	1¼"x2' 3½"...	74
		2	16	Journal Box Bolts.....	1⅛ x1' 6¼ ...	81
	Cot.		8	Journal box lid, B.H ..	⅝ x0' 9 ...	6
		1 Hx.	2	Diagonal tie bar center bolt, Hexagon head .	⅞"x0' 4⅞"...	2
						163
					Forgings.....	1210
						1373

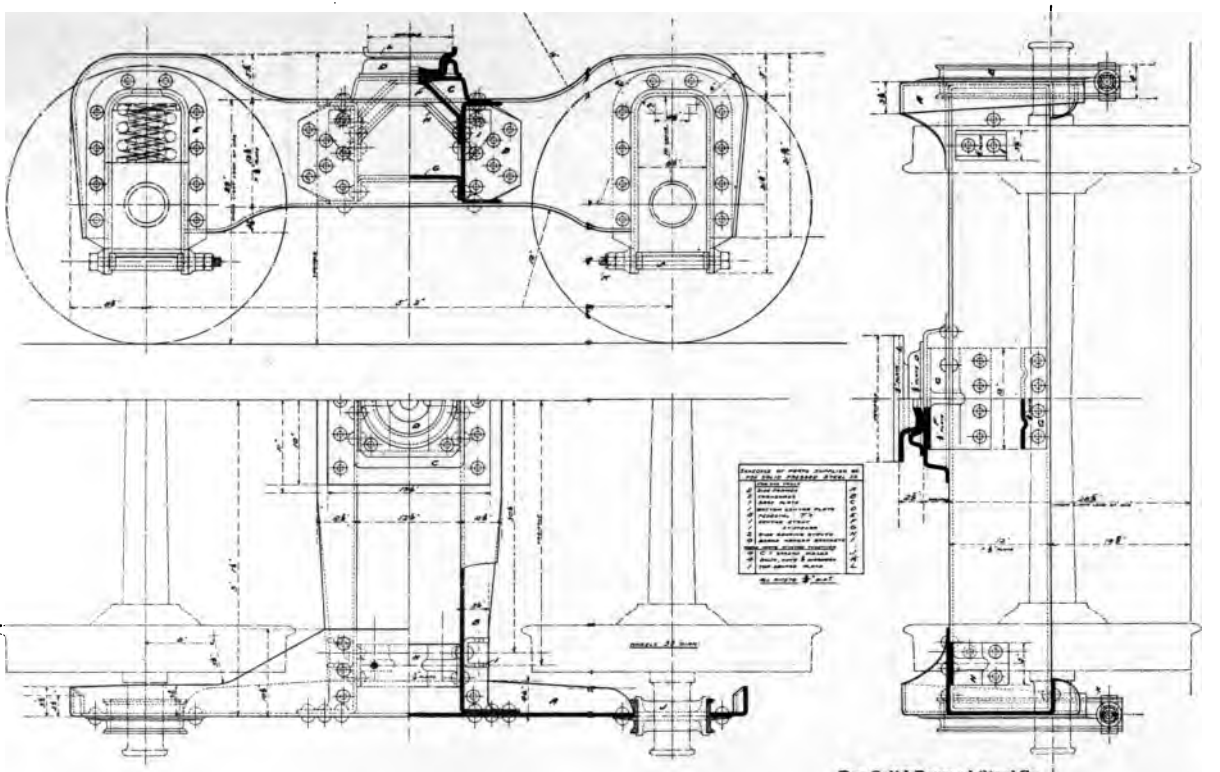
MISCELLANEOUS MATERIALS:

Per Car.	Description.	Size.	Weight
	The American Steel Truck Fittings complete, including two bolsters with center plates, side bearings and bolster guides, and with holes for dead lever guides, also for brake hanger carriers when required.....	.....	.....
4	Combination spring seats and bolster guide bars of such length for 4" arch bars with 1' 6" spread, all as supplied by The American Steel Foundry Co., of Granite City, Ill.....	.....	.....
8	Wheels, 33" diameter, 600 lbs each, M. C. B., Standard tread, guarantee and test, 5" core.....	.....	.....
8	Journal bearings, brass, lead lined, M. C. B.. Standard for 30 ton car.....	.....	100
4	Axles, No. 1 wrought scrap or muck bar, M. C. B., Standard for 30 ton car.....	.....	1968
8 gals	Car Oil	.....	.....
	Cotton Waste	.....	14
4 nests	Bolster Springs, Penna. "W" pattern. complete with plates 1⅛" coil, 7½" free over plates.....	.....	.....
8	Journal box lids, M. C. B., Standard, pressed steel	.....	.....
8	Cotters for box lid bolts	3/16"x1¼"	
16	U. S. Standard Square Nuts.	For 1¼ bolt,	16¼
32	" " " "	" 1⅛ "	24
			40¼
2	" " Hexagon Nuts.....	" ⅞" "	1
	Paint materials	.....	

SUMMARY.

Quantity.		Specifications.	Price.	Am'nt
5	feet.	Lumber, basswood		
34	"	" oak		
776	lbs.	Castings, gray iron		
1373	"	Wrought iron		
2	sets.	American Steel Truck Fittings.		
40¼	lbs.	Square nuts		
1	"	Hexagon nuts		
8		Wheels, 33", 600 lbs. each		
1968	"	Axles, iron		
100	"	Journal bearings		
4	nests.	Bolster springs		
8	gals.	Car oil		
14	lbs.	Waste, cotton		
8		Journal box lids		
8		Spring cotters		
		Paint materials		
		Labor:		
		Lumber yard		
		Mill		
		Blacksmith		
		Bolt room		
		Iron machine		
		Fitting wheels and axles		
		Truck builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

FOX PATENT PRESSED STEEL FREIGHT CAR TRUCK



Fox Solid Pressed Steel Co.
Chicago, Ill.

COMPLETE BILL OF MATERIALS FOR ONE SET OF FOX PRESSED STEEL 30-TON TRUCKS.

GENERAL DIMENSIONS.

Wheel Base.....5′ 2″
Center to Center of Journal.....6 3
Arranged for Outside Hung Brakes.

LUMBER.

Pcs.	Description.	Material.	Finished Size.	Rough Size.	B. M.
8	Dust Guards.....	Basswood	$1\frac{1}{16}$″x $7\frac{7}{8}$″x$10\frac{1}{4}$″	1″ x 8″x1′ 0″	5′

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Weight.
8	.....	Journal Boxes, $4\frac{1}{4}$″x8″ Journal..	Gray Iron..	710
8	.....	" " wedges.....	" " ..	80
4	.....	Side bearings.....	" " ..	50
8	.....	Spring caps.....	" " ..	135
				975

BOLTS.

C. W.	W.W.	Nuts.	Pcs.	Description.	Size of Blank.	Weight.
.....	.....	1	8	Side bearing to truck	$\frac{5}{8}$″x0′ $4\frac{1}{2}$″.....	3
.....	.....	Cot.	8	Journal box lid, B. H.	$\frac{5}{8}$ x0 9	6
						9

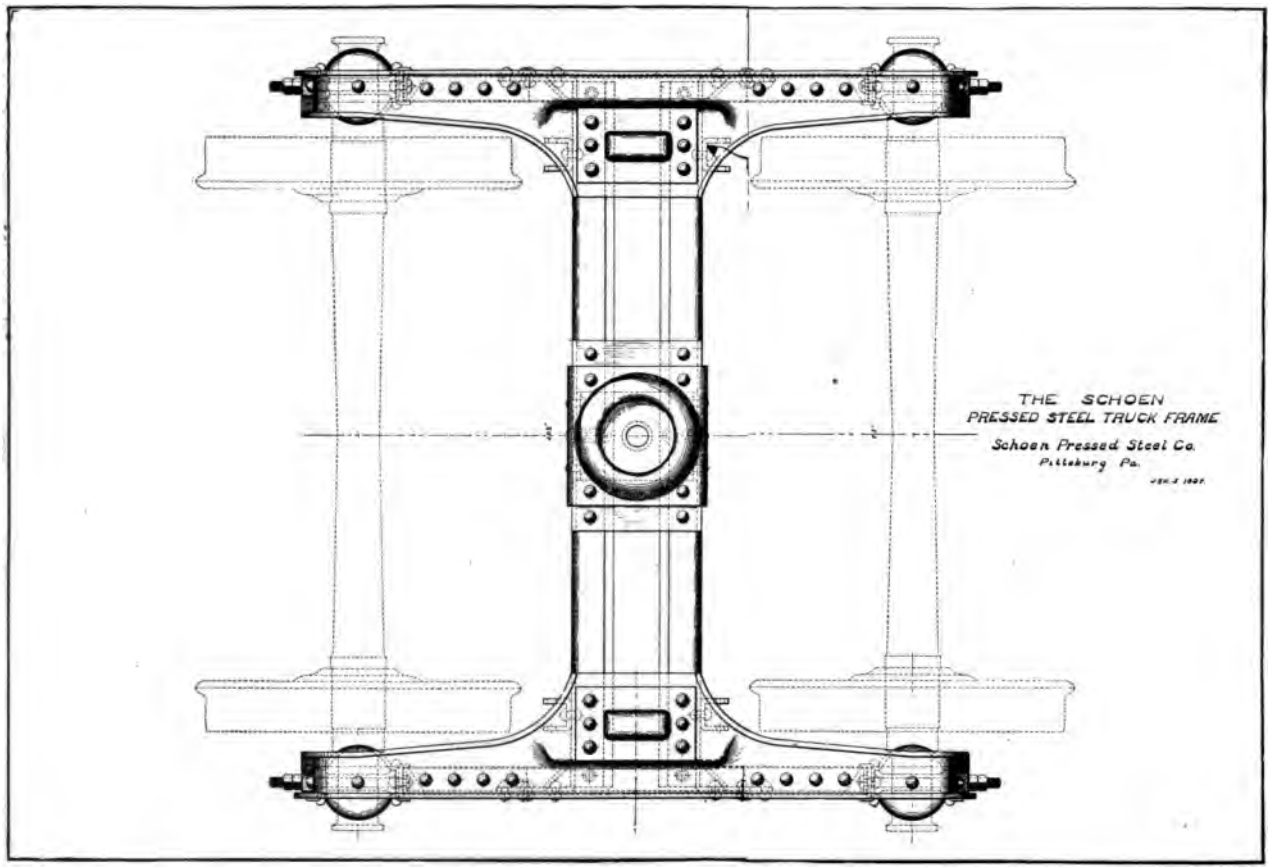
MISCELLANEOUS MATERIAL.

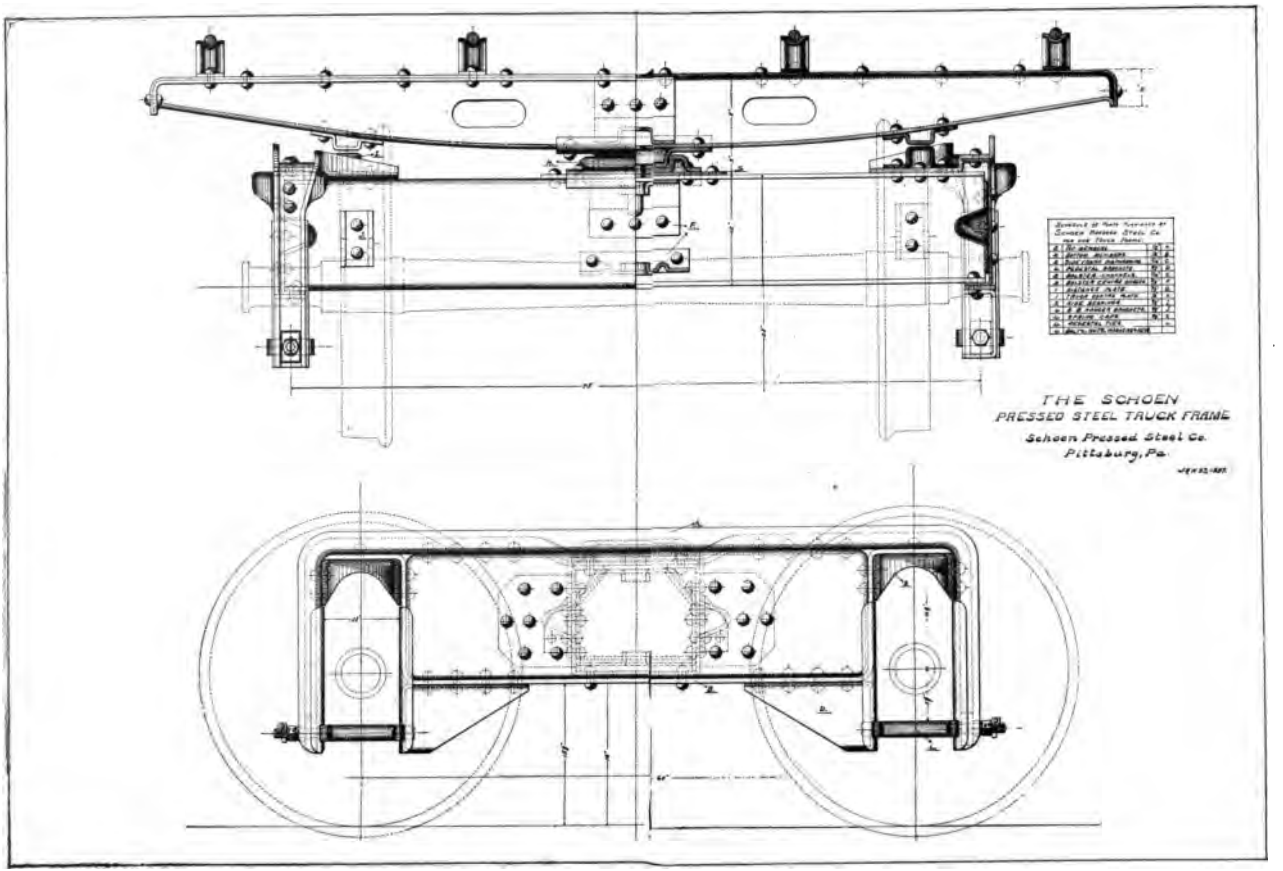
Per Car.	Description.	Size.	Weight.
2	Fox pressed steel truck frames complete with body and truck center plates for cars of 30 tons capacity; 6′ 3″ center to center of journal; 5′ 2″ wheel base...	.....	.....
	N. B.—As the body center plates are furnished with pressed steel trucks they should always be included in the quotation for the trucks; this will allow a credit on the car body of whatever amount that may have been included for center plates. If inside brakes are used, credit should be given the Fox Truck for brake hanger carriers and fastenings.		
	All as supplied by the Fox Pressed Steel Equipment Co., New York, N. Y.		
8	Wheels, 33″ diam., 600 lbs. each, M. C. B. Std. tread, guarantee and test, 5″ core.....	.....	.....
8	Journal bearings, brass, lead lined, M. C. B. Std. 30 ton....	.....	100
4	Axles, No. 1 wrought scrap or muck bar, M. C. B. Std. 30 ton	.....	1968
8 gals.	Car oil.....	.....	.....
	Cotton waste.....	.....	14
8	Journal box springs, Fox Truck pattern, for cars 30 tons capacity	.....	.....
8	Journal box lids of M. C. B. Std., pressed steel.....	.....	.....
8	Spring Cotters for box lid hinge bolt	3/16″x1¼″	.....
8	U. S. Std. Square Nuts.....	For ⅝″ bolt	1¼
	Paint materials.....	.....	.....

FOX PRESSED STEEL 30 TON TRUCK—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am'nt
5	feet.	Lumber, poplar or basswood...		
975	lbs.	Gray iron castings.....		
9	"	Wrought iron		
2		Fox truck frames		
8		Wheels, 33", 600 lbs. each		
100	lbs.	Journal bearings.....		
1968	"	Axles, iron.....		
8	gals.	Car oil.		
14	lbs.	Waste, cotton		
8		Springs for Fox trucks.....		
8		Journal box lids		
8		Spring cotters.....		
1¼	lbs.	Square nuts		
		Paint materials		
		Labor :		
		Lumber yard.		
		Mill.....		
		Bolt room		
		Fitting wheels and axles.....		
		Truck builders		
		Painters.		
		General labor		
		" expense.		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense.....		
		N. B.—From this total should be deducted the cost of body center plates to arrive at actual cost of Fox Truck as compared with other trucks.		


THE SCHOEN
PRESSED STEEL TRUCK FRAME
Schoen Pressed Steel Co.
Pittsburg Pa.



THE SCHOEN
PRESSED STEEL TRUCK FRAME
Schoen Pressed Steel Co.
Pittsburg, Pa.

COMPLETE BILL OF MATERIAL FOR ONE SET OF SCHOEN PRESSED STEEL 30 TON TRUCKS.

GENERAL DIMENSIONS.

Wheel base ..... 5′ 2″
Center to center of journal 6 3
Arranged for outside hung brakes.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
8	Dust guards..	Basswood ..	$^{11}/_{16}$″x 7$\frac{7}{8}$″x 10$\frac{1}{4}$″	1″x8″x1′ 0″.....	5′

CASTINGS.

Pcs.	Patterns.	Description.	Mat'l.	Wt.
8	.....	Journal boxes, 4$\frac{1}{4}$″x8″ journal	Gray Iron..	710
8	.....	" " wedges.	" " ..	80
				790

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
		Cot.	8	Journal box lids, B. H.....	$\frac{5}{8}$″x0′ 9″....	6
						6

SCHOEN TRUCKS—(Continued).

MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Weight.
2	Schoen Pressed Steel Truck frames complete, with truck center plates, side bearings, spring caps (and brake hanger carrier if inside brakes), for cars of 30 tons capacity; 6′ 3″ center to center of journal; 5′ 0″ wheel base.		
	If inside brakes are used credit should be given the Schoen truck for brake hanger carrier and fastenings	.....	.....
8	Wheels, 33″ diameter, 600 lbs each, M. C. B., Standard tread, guarantee and test, 5″ core	.....	.....
8	Journal bearings, brass, lead lined, M. C. B., Standard, 30 ton	.....	100
4	Axles, No. 1 wrought scrap or muck bar, M. C. B., Standard 30 ton	.....	1968
8 gals.	Car Oil	.....	
	Cotton Waste	.....	14
8	Journal Box Springs, Schoen truck pattern, for cars of 30 tons capacity	.....	.....
8	Journal Box Lids, M. C. B., Standard pressed steel	.....	.....
8	Spring cotters for box lid hinge bolt	$\frac{3}{16}$″x1$\frac{1}{4}$″	
	Paint materials	.....	.....

SCHOEN TRUCKS—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
5	feet.	Poplar or basswood		
790	lbs.	Gray iron castings		
6	"	Wrought iron		
2		Schoen truck frames		
8		Wheels, 33", 600 lbs. each		
100	lbs.	Journal bearings		
1968	"	Axles, iron		
8	gals.	Car oil		
14	lbs.	Waste, cotton		
8		Springs for Schoen trucks		
8		Journal box lids		
8		Spring cotters		
		Paint materials		
		Labor :		
		Lumber yard		
		Mill		
		Bolt room		
		Fitting wheels and axles		
		Truck builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

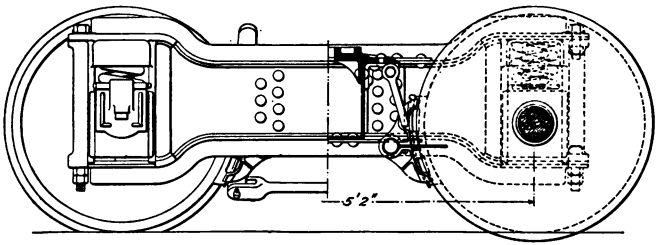


Fig. 1.—Half Side Elevation.

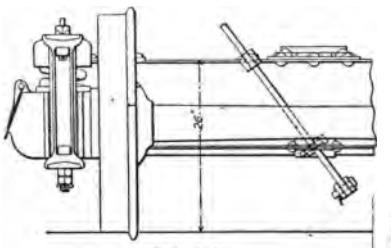


Fig. 2.—Half Section through Center Plate.

Fig. 3.—End View.

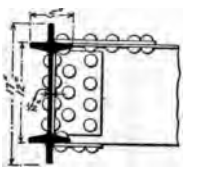


Fig. 5.—Section Through Frame at A, B.

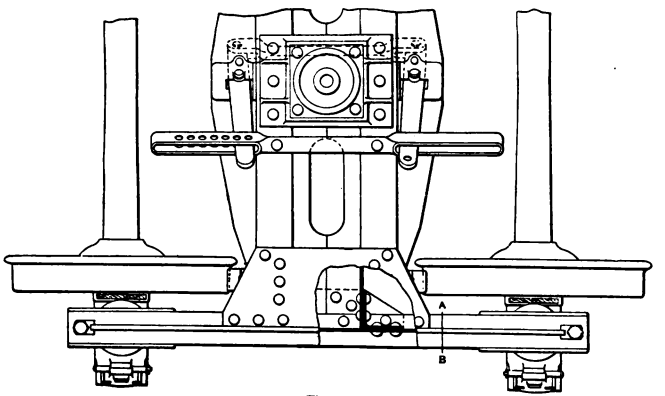


Fig 4.—Plan.

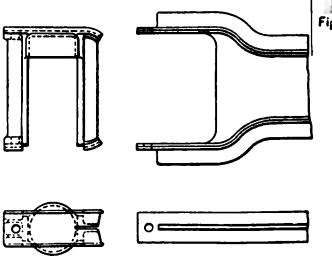


Fig. 6.—Pedestal Arrangement.

The Hewitt Rolled Steel Truck.

COMPLETE BILL OF ALL MATERIALS FOR ONE SET OF HEWITT ROLLED STEEL 30 TON TRUCKS.

GENERAL DIMENSIONS.

Wheel Base ..... 5′ 2″
Center to Center of Journals ..... 6′ 3″
Arranged for Outside Hung Brakes.

LUMBER.

Pcs.	Description.	Material.	Finished Size.	Rough Size.	B.M.
8	Dust Guards	Basswood	1 1/16″x7 3/8″x10 1/4″	1″x 8″x 1′ 0″	5′

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Weight.
8	.....	Journal Boxes, 4 1/4″x8″ Journal..	Gray Iron..	710
8	.....	" " wedges.....	" " ..	80
4	.....	Side Bearings.....	" " ..	50
				840

BOLTS.

C. W.	W.W.	Nuts.	Pcs.	Description.	Size of Blank.	Weight.
.....	.....	1	8	Side bearing to truck	5/8″x0′ 4 1/2″	3
.....	Cot.	.....	8	Journal box lid, B. H.	5/8 x0 9	6
						9

HEWITT ROLLED STEEL TRUCK—(Continued.)

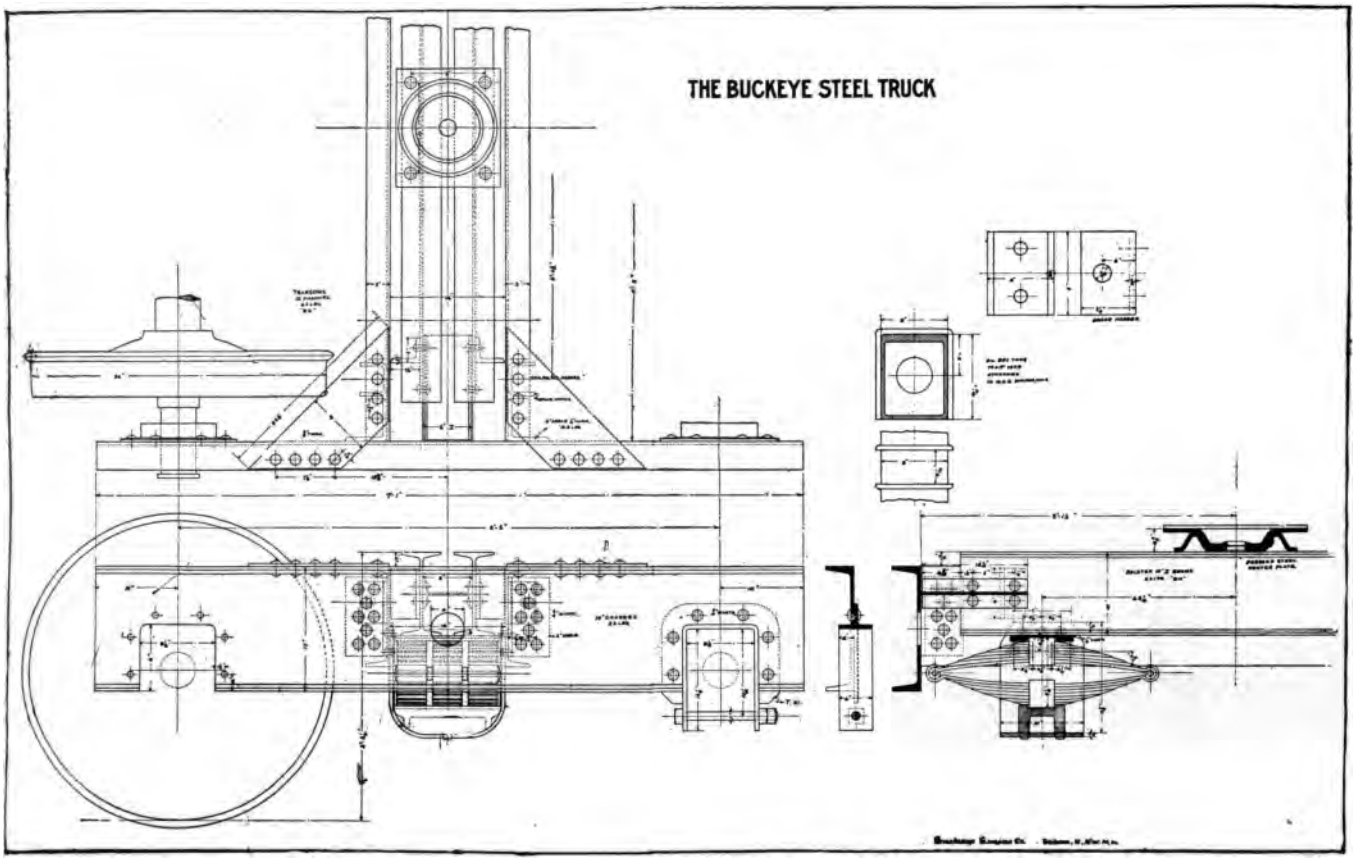
MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Weight.
2	Hewitt Rolled Steel Truck Frames, complete, including malleable iron center plate saddles and 4 malleable iron pedestals, also bolts, nuts and nut locks for securing pedestals; for cars of 30 tons capacity, 6′ 3″ center to center of journals, 5′ 2″ wheel base	.....	.....
2	Malleable iron center plates, these may be furnished riveted to truck frames if so desired, but an extra price is charged over and above the regular quotation, which is without center plates	.....	.....
	All as supplied by H. H. Hewitt, of Buffalo, N. Y. N. B.—The estimator should include 2 malleable iron center plates with rivets or bolts for securing same to truck frame, or be positive that the quotations for truck includes these riveted to them. If inside brakes are required, give location of holes for lever guides and hanger carriers.		
8	Wheels, 33″, 600 lbs. each, M. C. B. Std. tread, guarantee and test, 5″ core	.....	.....
8	Journal bearings, brass, lead lined, M. C. B. Standard for 30 ton cars	.....	100
4	Axles, No. 1 wrought scrap or muck bar, M. C. B. Standard 30 ton	.....	1968
8 gals.	Car oil	.....	.....
	Cotton waste	.....	14
8	Journal box springs, Hewitt truck pattern for cars of 30 tons capacity	.....	.....
8	Journal box lids, M. C. B. Standard pressed steel	.....	.....
8	Spring Cot's box lid hinge bolt	3/16″x1¼″	
8	U. S. Standard square nuts	For ⅝″ bolt,	1¼
	Paint materials	.....	.....

HEWITT ROLLED STEEL TRUCKS—(Continued).

SUMMARY.

Quantity.		Specifications.	Price	Am'nt.
5	Feet.	Lumber, basswood		
840	lbs	Castings, gray iron		
9	"	Wrought iron		
2		Hewitt truck frames		
2		Malleable iron center plates		
8		Wheels, 33", 600 lbs each		
100	lbs	Journal bearings		
1968	"	Axles, iron		
8	gals	Car oil		
14	lbs	Waste, cotton		
8		Springs, Hewitt truck		
8		Journal box lids		
8		Cotters		
1¼	lbs	Square nuts		
		Paint materials		
		Labor.		
		Lumber yard		
		Mill		
		Bolt room		
		Fitting wheels and axles		
		Truck builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		


THE BUCKEYE STEEL TRUCK

COMPLETE BILL OF MATERIAL FOR ONE SET OF BUCKEYE STEEL 30-TON TRUCKS.

GENERAL DIMENSIONS.

Wheel base ..... 5′ 5″
Center to center of journals 6 3
Arranged for outside hung brakes.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
8	Dust guards	Basswood.	1 1/16″x7 3/8″x10 1/4″	1″x8″x1′ 0″	5′
4	Side bearing fillers	Oak.	.....	1 x6 x1 0	2
					7′

CASTINGS.

Pcs.	Patterns.	Description.	Mat'l.	Wt.
8	.....	Journal boxes, 4 1/4″x8″ journal	Gray Iron.	710
8	.....	" " wedges.....	" "	80
4	.....	Side bearings.....	" "	50
				840

BOLTS.

C. W.	W W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
		1	8	Side bearing to bolster	5/8″x0′ 4 1/2″	3
Cot.			8	Journal box lid, B. H	5/8 x0 9	6
						9

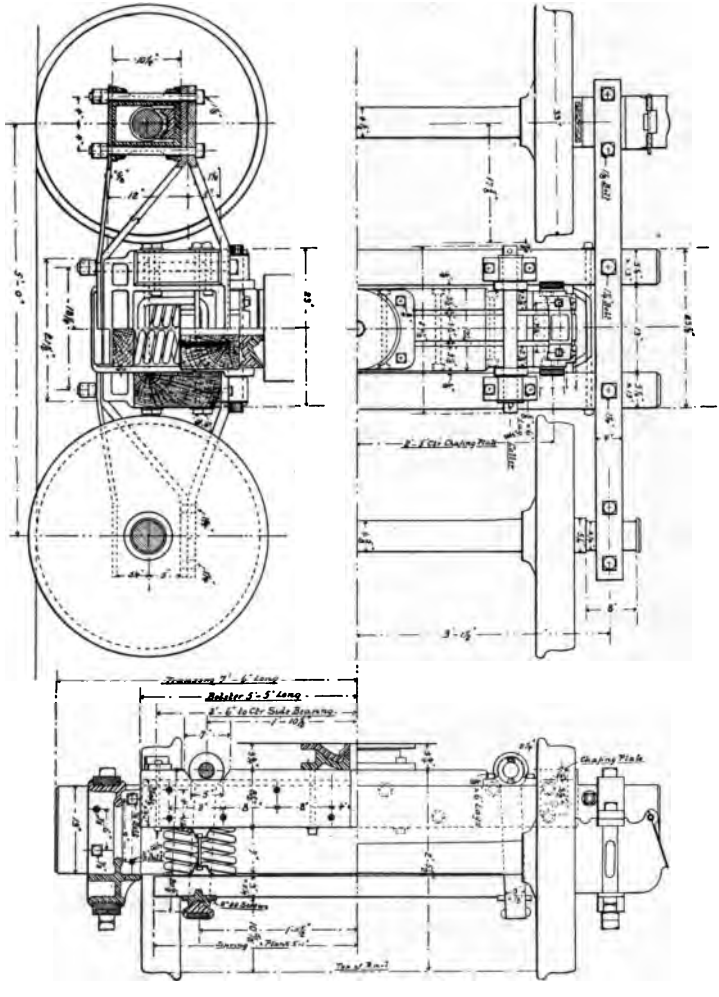
MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Weight.
	The Buck-eye Steel Truck Frames, complete for one car, including truck bolster, spring seats, pedestal jaw, bolts with nuts and brake hanger carriers when inside brakes are used. All as supplied by the Buck-eye Engine Co., Salem, Ohio		
2	Pressed Steel Center Plates, (These are not furnished with Truck.)		
8	Wheels, 33″ diam., 600 lbs. each, M. C. B., Standard tread, guarantee and test, 5″ core		
8	Journal bearings, brass, lead lined, M. C. B., Standard for 30-ton cars		100
4	Axles, No. 1 Wrought Scrap or Muck Bar, M. C. B. Standard for 30-ton car		1968
8 gals.	Car Oil		
	Cotton Waste		14
4 nests.	Bolster Springs, Penn. "W" Pattern, complete with plates, 1⅛″ coil, 7½″ free over plates		
8	Journal Box Lids, M. C. B. Standard, Pressed Steel		
8	Spring Cotters, for box lid hinge bolt	3/16″x1¼″	
8	U. S. Standard Square Nuts.	For ⅝″ bolt.	1¼
	Paint Materials		

BUCKEYE STEEL TRUCK—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
5	feet.	Lumber, basswood		
2	"	" oak		
840	lbs.	Castings, gray iron		
9	"	Wrought iron		
2		Buckeye steel truck frames		
2		Pressed steel center plates		
8		Wheels, 33", 600 lbs. each		
100	lbs.	Journal bearings		
1968	"	Axles, iron		
8	gals.	Car oil		
14	lbs.	Waste, cotton		
4	nests.	Springs, bolster		
8		Journal box lids		
8		Spring cotters		
1¼	lbs.	Square nuts		
		Paint Materials		
		Labor:		
		Lumber yard		
		Mill		
		Bolt room		
		Fitting wheels and axles		
		Truck builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		



30 TON SWING MOTION TRUCK

COMPLETE BILL OF MATERIALS FOR ONE SET OF SWING MOTION 30-TON TRUCKS.

(Cut No. 2).

GENERAL DIMENSIONS.

Wheel base	5′ 0″
Center to center of journals	6 3
Spread of arch bars	1 5
Top of rail to top of bolster	2 5½

Arranged for outside hung brakes.

LUMBER.

Pcs.	Description.	Material.	Finished Size.	Rough Size.	B. M.
	Truck Frames, etc.				
2	Spring planks	Oak	3 "x11¼"x5′ 5 "	3¼"x11¼"x5′ 5"	34′
4	Transoms	"	5¼ x13 x7 6	5¼ x13¼ x7 9	188
8	Dust guards	Basswood	11/16 x 7⅞ x 10½	1 x 8 x1 0	5
				Truck Frames etc	227′
	Bolsters:				
2	Bolster members	Oak	3¾ "x 8½"x5′ 5 "	4 "x 8½"x5′ 6"	32
4	" " ...	"	3½ x 8½ x5 5	3¾ x 8½ x5 6	60
				Bolsters	92′
				Total	319′

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Weight.
		Truck Frame, etc.		
8		Journal boxes, 4¼"x8" journal	Gray Iron	696
8		" " wedges	" "	80
4		Transom castings	" "	624
8		Swing hanger pivot bearings, upper	" "	84
4		" " " " lower	" "	54
4		" " " " "	" "	56
8		Chafing plates, transom	" "	32
				1626
		Bolsters:		
4		Side bearings	Gray Iron	50
2		Center plates	" "	134
8		Chafing " bolster	" "	28
				212
			Total	1838

30 TON SWING MOTION TRUCKS—(Continued.)

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				Truck Frames, etc.:		
			4	Arch bars, 5" set	4 "x 1¼" x 6' 3½"	420
			4	" " inverted, 12" set	4 x 1 x 7 0	373
			4	Tie bars, 2½" set	4 x ⅝ x 6 1½	204
			4	Swing hangers	3 x ⅞ x 3 4	117
			4	" " heads	5 x 1½ x 1 3	125
			4	" " pivots, upper	2¼ x 2 ½	108
			8	" " " washers	4 x ¼ x 0 4	9
			8	" " " cotters	⅝ half r'd x 7"	2
						1358
				Bolsters:		
			4	Bolster plates	7 "x ¾" x 5' 4 "	373
					Total forgings	1731

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				Truck Frames:		
		2	8	Columns	1¼" x 2' 1½"	68
		2	16	Journal boxes	1⅛ x 1 6¼	81
	2	1	8	Transoms together	⅞ x 2 2¾	36
	1	1	16	" and castings	⅞ x 0 9¼	25
			16	Spikes, C. S. H	⅝ x 0 3¼	4
			16	Swing hanger pivots, lags	¾ x 7 7⅞	16
	1cot		8	Box lid hinge bolts, B.H.	⅝ x 0 9	6
						236
				Bolsters:		
		1	8	Center plates	¾" x 1' ⅜"	12
		1	8	Side bearings	⅝ x 0 11¾	8
	2	1	8	Bolsters together, center	¾ x 1 1⅝	14
	2	1	12	" " end	¾ x 1 ⅜	18
			16	Spikes, C. S. H	⅝ x 0 3¼	4
						56
					Total bolts	292
					" forgings	1731
					Total wrought iron	2023

MISCELLANEOUS MATERIALS.

PerCar.	Description.	Size.	Wt.
8	Wheels, 33" diam., 600 lbs each, M. C. B. Std. tread, guarantee and test, 5" core		
8	Journal bearings, brass, lead lined, M. C. B. Std. 30 tons		100
8	M. C. B. box lids, pressed steel		
4	Axles, No. 1 wrought scrap or muck bar, M. C. B. Std. 30 ton		1968
8 gals.	Oil		
	Cotton waste		14
4	Bolster springs, Penna. "W" pat., complete with plates, 1⅛" coil, 7¼" free over plates		
16	Wood screws	2" No. 20	
8	Cotters, for box lid hinge bolt	3/16"x1¼"	

30-TON SWING MOTION TRUCKS—(Continued.)

MISCELLANEOUS MATERIALS—(CONTINUED.)

Per Car.	Description.	Size.	Weight.
	NUTS AND WASHERS:		
	Truck Frame:		
16	U. S. Standard Square Nuts	For 1¼" bolt,	16
32	" " " "	" 1⅛ "	24
24	" " " "	" ⅞ "	9
	Bolsters:		49
28	U. S. Standard Square Nuts	For ¾" bolt	7
8	" " " "	" ⅝ "	1
			8
	Truck Frame:	Total nuts	57
32	Wrought washers	For ⅞" bolt	4
	Bolsters:		
40	Wrought Washers	For ¾" bolt	4
		Total washers	8
	Paint materials.		

SUMMARY:

Quantity.		Specifications.	Price.	Amount.
314	feet.	Lumber, oak		
5	"	" basswood		
1838	lbs.	Castings, gray iron		
2023	"	Wrought iron		
57	"	Square nuts		
8	"	Wrought washers		
8		Wheels, 33", 600 lbs. each		
1968	lbs.	Axles, M. C. B., Std., 60,000 lbs		
100	"	Journal bearings		
4	nests	Bolster springs		
8		Spring cotters		
16		Wood screws		
14	lbs.	Waste		
8	gals.	Car oil		
8		Journal box lids		
		Paint materials		
		Labor:		
		Lumber yard		
		Mill		
		Blacksmith		
		Bolt room		
		Iron machine		
		Fitting wheels and axles		
		Truck builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION:		
		Materials		
		Labor		
		General expense		

CHAPTER III.

BODIES.

Freight Car Bodies are divided into the following general classes: 1st, all those that are commonly known as flat or platform cars; 2nd, all those that are commonly known as gondola cars; 3rd, all those that are commonly known as box cars; 4th, all those that are commonly known as stock cars.

Under the first classification there is scarcely any difference in the general construction; they do, however, differ very widely in the details which have been adopted to suit various purposes.

Under the second classification, however, it is quite different, as this class includes all cars used for the purpose of hauling coal, ore, sand, and other materials which are not affected by the weather, and the construction differs very widely to meet the various conditions to which they are subjected.

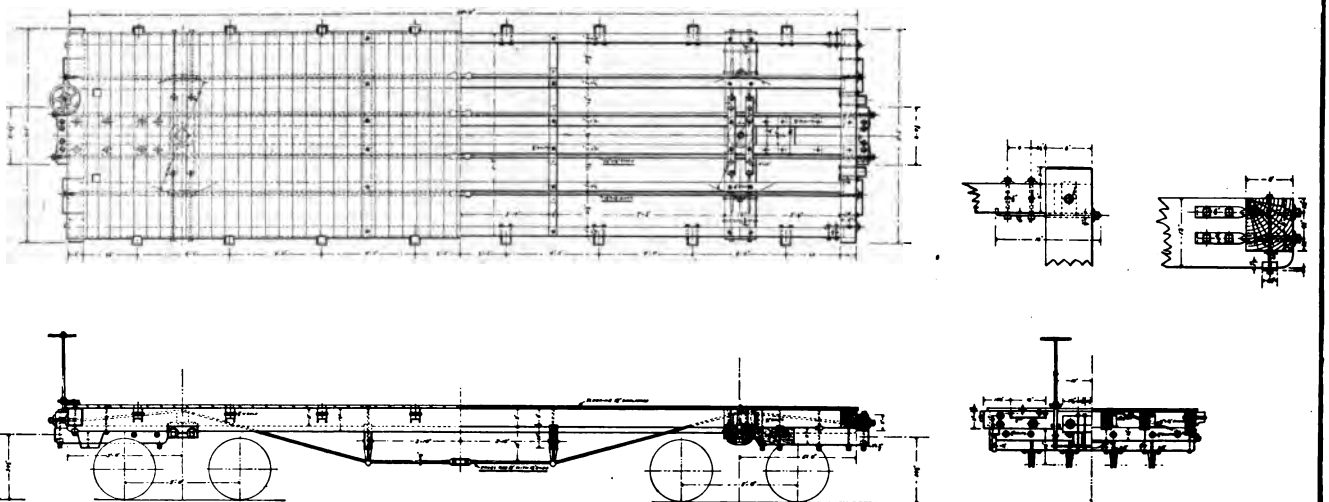
Under the third class are all cars built for the purpose of protecting the freight from the weather, and includes furniture, fruit, refrigerator, etc.

Under the fourth class all cars are included that are designed for the purpose of transporting stock, and many patents now exist covering special feeding and watering facilities which have been found necessary to make the fast time demanded by shippers.

In addition to the above general classifications there are many cars constructed for special purposes, all of which will come under one or the other of the foregoing classifications.

The following illustrations and bills of material are for the purpose of conveying the proper method of compiling a bill of material for the different classifications; and an ordinarily constructed car of the different classes is used as a basis.

30 TON FLAT CAR



30 TON FLAT CAR.

GENERAL DIMENSIONS.

Length over end sills	34′	0″
Width over side sills	8	9
Height from top of rail to center of draw bar	2	10½
Couplers, M. C. B. Standard		
Brakes, M. C. B. Standard without air, plated beams		
Bolsters, wood trussed		
Draw Gear, pocket attachment		

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
2	Side sills	Pine.	5 "x12 " x34′ 0 "	5¼"x12¼" x34′ 0 "	364
2	Intermediate sills	"	5 x 9 x32 11	5¼ x 9¼ x34 0	275
2	Center sills	"	5 x 9 x32 11	5¼ x 9¼ x34 0	275
	Flooring	"	1¾ x 5½ to 9½ x8 11	2 x 6to10x 9 0	720
2	End sills	Oak.	8 x 9 x9 3	8¼ x 9¼ x 9 6	121
2	Cross ties	"	4 x11 x8 9	4¼ x11¼ x 9 0	72
				Body	1827′
	Draw Gear.				
4	Draw timbers	Oak.	5 "x 9 " x4′ 10½"	5¼"x 9¼" x 5′ 3 "	85
2	Draw timbers, fillers	"	9 x 9½ x1 7¼	9¼ x 9½ x 2 0	29
2	Buffer blocks	"	6¼ x 8 x2 4½	6½ x 8¼ x 2 9	25
4	Nut locks	"	⅞ x 2⅜ x1 11¾	1 x 3 x 2 0	Cut'g
				Draw Gear	139′
	Bolsters.				
4	Body bolst'r members	Oak.	6½"x 8 " x8′ 9 "	6¾"x 8¼" x 9′ 0 "	167
2	King bolt blocks	"	8 x 9¼ x1 4	8¼ x 9½ x 1 6	20
				Bolsters	187′
	Brakes.				
4	Brake hanger blocks	Oak.	4 "x 9 " x1′ 10⅜"	4¼"x 9¼" x 2′ 0 "	26
4	Brake beams	"	4 x 7 x5 7	4¼ x 7¼ x 5 9	59
1	Floating lever fulcrum block	"	4 x 6 x1 7¼	4¼ x 6¼ x 1 9	4
				Brakes	89′
				Total	2242′

30-TON FLAT CAR—(Continued.)

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Weight.
8	.....	Body Truss Rod Washers.....	Gray Iron.	46
8	.....	Body Truss Rod Bearings.....	" "	120
20	.....	Body Stake Pockets.	" "	220
12	.....	Body Round Washers, ¾" Bolt	" "	8
16	.....	Body Round Washers, ⅝" Bolt	" "	6
			Body. . .	400
		Draw Gear.		
4	.....	Draw Bar Stops, rear.	Gray Iron.	78
4	.....	" " " front	" "	68
4	.....	Timber guards.....	" "	22
8	.....	Draw timber keys...	" "	36
16	.....	Cup washer, ⅞" bolt.	" "	24
8	.....	Plain washer, ⅞" "	" "	8
			Draw Gear	236
		Bolsters.		
4	.....	Bolster Truss Rod Washers.....	Gray Iron.	80
2	.....	Body Center Plates..	" "	132
4	.....	" Side Bearings.	" "	66
4	.....	" Truss Rod Saddles	" "	66
4	.....	Body and Bolster Truss Rod Saddles.	" "	106
16	.....	Plain Washers, ¾" bolts.	" "	13
			Bolsters . .	463
		Brakes.		
8	....	Brake Heads, M.C.B. Christie	Gray Iron.	152
8	.....	Brake Shoes, M. C. B. Christie	" "	148
1	.....	Brake Hand Wheel..	" "	19
1	.....	Brake Ratchet Wheel	" "	7
1	.....	Brake Pawl.....	" "	3
1	.....	Shaft Bearing	" "	3
8	.....	Plain washers, ⅝" bolt	" "	3
8	.....	Cup washers, 1" bolt.	" "	16
				351
			Total	1450

30 TON FLAT CAR—(Continued).

FORGINGS :

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
		2	18	Stake pocket U bolts	¾″ x 2′ 3⅜″	62
		2	2	" " " "	¾ x 2 6⅜	8
			20	" " " " washers	2 x ¼″ x 8½	24
1		1	8	Strap bolts, side and end sill	2 x ½ x1 1½	30
			2	King bolts	1¾ x 2 4	37
			2	" " covers	6 x ¼ x 6	5
			2	Sill steps	2 x ½ x2 10	19
			4	Grab irons on end sill	⅝ x 1 11½	8
			2	" " " side "	⅝ x 2 5½	5
			4	Clip washers under side sill	2½ x ⅜ x 7	7
			8	Truss rod guards	¼ x5	1
						206
					Bolts and Rods.	649
						855
				Draw Gear :		
			1	Draw bar carry iron	3 "x ⅞"x2′ 8 "	23
			1	" " " "	3 x ⅞ x1 11	17
			2	" " buffer plates	3 x ¾ x2 4½	36
			2	" " pockets	4 x1 x3 7¾	98
			2	" " uncoupling rods	1 x 5 3	27
			4	" " follower plates	6 x1½ x 9	90
			8	" " " " guides	2 x ⅝ x1 3⅛	43
						334
					Bolts and Rods.	161
						495
				Body Bolsters:		
			2	Plates on bolsters	5½″x ⅛″x 1′ 8″	8
			4	Bolster truss straps	4 x ½ x 5 6	147
						155
					Bolts and Rods.	217
						372
				Brakes, M. C. B. Without Air.		
			4	Brake beam plates	4 "x ¼″x5′ 6¾″	74
			8	" " guides	⅞ x 0 10½	14
			8	" shoe keys	⅞ x ½ x0 10	10
		2	8	" lever fulcrums, 1″ shank	2½ x ¾ x0 11	46
			4	" " " washer	3 x ¼ x0 3	3
	1	1	8	" safety hanger hook bolts	⅝ x 0 9	6
			8	" " " } 21¾″ links	½ x 2 ½	11
			8	" " " { inside	½ x 1 5½	8
	2	1	8	" " " eye-bolt	⅝ x 1 2	9
			8	" hanger } 20½″ loop	⅞ x 2 2	35
			8	" " { inside shank	1 x 1 5	30
Cup	1	1	8	" " eye-bolt	1 x 1 7	33
					Carried For'd.	279

30-TON FLAT CAR—(Continued)

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				BRAKES—(Continued.)	Brought forward.	279
			2	Live levers, 8" & 24" ctrs..	4 "x1 "x 2' 6 "	67
			2	Dead " 7" & 21" ctrs.	4 x1 x 2 2	58
			8	Lower connection } jaws.	2½ x ¾ x 0 9	38
			2	7' 2½" ctrs. } rods.	¾ x 6 ½	18
		cot.	18	Connection Pins.....	1⅛ x 0 4½	22
			4	Dead lever guide } jaws ..	2½ x ½ x 1 6	25
			2	3' 3¼" from center to } rod....	¾ x 2 4	7
	2	1	2	inside eye. } eye bolt	⅞ x 2 1	8
			4	Upper connection, brake } jaws..	2½ x ¾ x 0 9	19
			1	end 12' 9½" ctrs. } rod.	¾ x 11 7½	17
			4	Upper connection opp'te } jaws.	2½ x ¾ x 0 9	19
			1	end 10' 5¼" ctrs. } rod.	¾ x 9 3¼	14
			4	Cylinder connection } jaws.	2½ x ¾ x 0 9	19
			1	7' 8¾" center } rod.	¾ x 6 6¾	10
			2	Hand brake connection } jaws.	2½ x ¾ x 0 9	9
			1	13' ½" ctr. to ins. hook } rod.	¾ x 13 ½	20
			1	Cylinder lever 20" 9" & 7" ctrs ..	3½ x1 x 2 11	34
			1	Floating lever 6½x14½ ctrs.....	3½ x1 x 1 10	21
			3	Lever guides. }	1 x 3 7	28
			1	Floating lever fulcrum, }	2½ x ½ x 2 4½	10
			1	" " "	2½ x ½ x 1 0	4
	1	1	1	Brake shaft } Threaded ¾"	1½ x 1 3	7
			1	" " } on top.	1¼ x 3 0	12
			1	" " Ratchet key	⅜ x ⅜ x 0 2½	1
			1	" " Bracket.	4 x ½ x 1 0	7
						773
					Bolts and rods.	38
						811

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
1	1	1	8	Cross ties, sills and truss rod bridges	¾"x 1' 10¾" }	34
1	1	1	4	" " and side sills.	¾ x 1 10¾ }	
1		1	6	Strap bolts and side sills.....	⅝ x 8⅜	11
		1	2	Steps and side sills	⅝ x 1 3½	3
		1	2	" " " and end sill.....	⅝ x 1 3½	3
	1	1	2	Side and end sills and clip washers..	⅝ x 1 3	3
			12	Grab iron, side and end sill, lags....	⅝ x 4¾	5
1		1	4	Body truss rods, 1½" upset.....	1¼ x 17 7	288
1			4	" " " " "	1¼ x 18 1	296
			8	Truss rod br'g and cross tie, lags...	¾ x 5½	6
						649

30 TON FLAT CAR—(Continued.)

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				Draw Gear :		
Cup	1	2	16	Draw timber & Ctr. Stills	7/8"x 1' 11 1/4"	62
1		2	8	" " " Buffers	7/8 x 1 7 5/8	26
	2	1	4	" " Tie Bolts	3/4 x 1 10 3/4	11
	1	1	24	" " & Stops	3/4 x 0 8 3/4	26
		2	8	" " Stops & Guides	7/8 x 0 11 3/4	16
			4	" Bar Pocket Rivets	1 1/8 x 0 11 1/2	13
			8	" " Uncoupling Rod Lags	1/2 x 0 4 1/4	2
			4	Buffer and Plate, Lags	5/8 x 0 5 1/4	2
	1	1	4	" " "	5/8 x 0 8	3
						161
				Bolsters :		
1	1	1	8	Bolsters and Side Sills	3/4"x 1' 6 1/4"	18
1	1	1	8	" " Int. "	3/4 x 1 6 1/4	18
		1	8	" " Cent. "	3/4 x 1 6 3/4	19
1		1	8	" Truss Bolts, 1 1/2" upset	1 1/4 x 3 9	120
			8	" Strap Rivets	1 x 0 5	9
			12	" & Side Bearings, Lag	5/8 x 5 1/4	5
	2	1	12	" Tie Bolts	3/4 x 1 7	28
						217
				Brakes :		
	1	1	16	Brake Beam & Plates, C. B	1/2"x 5 1/2"	5
	1	2	8	" " and Head	3/4 x 10 1/8	10
2		2	4	" Hanger Block Tie Rod	5/8 x 2' 8 7/8	11
	2	1	2	Floating Lever Fulcrum Block and Sills	5/8"x 1' 4 7/8"	3
	1	1	4	Floating Lever Fulcrum to Cross Ties and Block	1/2"x 0' 6 1/2"	1
			2	Floating Lever Fulcrum Rivets	3/4 x 0 4	1
			12	Lever Guides to Cross Ties and Sills, Lags	1/2"x 0' 4 3/4"	3
	1	1	2	Brake Shaft Bracket to End Sill	5/8 x 1 1 3/8	2
			2	" " Guides " " "	1/2 x 0 4 3/4	1
	1		1	" " Pawl " " "	3/4 x 0 8	1
						38
				Summary :		
				Body		855
				Drawgear		495
				Bolster		372
				Brakes		811
				Total Wrought Iron		2533

30 TON FLAT CAR.—(Continued.)

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
2	Draw Springs, Penna. "X," capacity 19,000 lbs	.....	....
4	Turnbuckles, 1½" Tap	.....	.....
	Nails, 20d cut for flooring	.....	34
8	Screws, 2" No. 16 for King Bolt Covers	.....	.....
2	Couplers, M. C. B. Std., complete with all necessary uncoupling rod brackets, clevises and pins	.....	.....
	Paint materials	.....	.....

U. S. STANDARD SQUARE NUTS.

	1½"	1"	⅞"	¾"	⅝"	½"	⅜"		
Body	8	....	....	60	22	....	....	.....	31½
Drawgear	....	....	64	28	4	..	....	.....	31½
Bolster	8	....	....	36	...	....	....	.....	22¼
Brake	....	16	2	17	28	22	....	.....	16¼
Total	16	16	66	141	54	22	....	.....	101½

WROUGHT WASHERS.

Body	....	....	....	12	6	....	....	.....	1¾
Drawgear	....	...	16	32	4	....	....	.....	5½
Bolster	....	....	....	40	....	....	....	.....	4
Brake	....	8	4	10	30	20	....	.....	5½
Total	....	8	20	94	40	20	....	.....	16¾

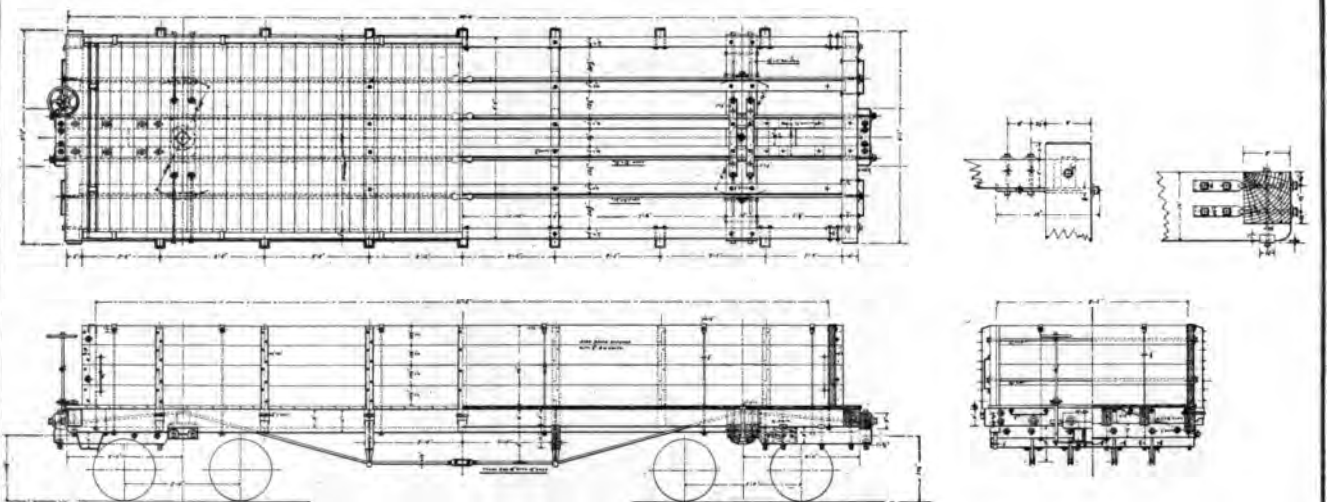
1	Brake Chain, ⅜" short link, 24" long from inside of eye bolt to inside of long link	⅜"x24 "	3
19	Spring Cotters for Connection Pins and Brake Shaft	⅜"x2¼"	.....

30-TON FLAT CAR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
914	feet.	Lumber, pine, sills, etc.....		
720	"	" flooring		
608	"	oak		
2,242	"			
		Kiln drying.....		
1,450	lbs.	Castings, gray iron.....		
2,533	"	Wrought iron.....		
101½	"	Square nuts.....		
16¾	"	Wrought washers.....		
34	"	Nails, cut.....		
8		Screws		
2		Draw springs.....		
19		Cotters.....		
3	"	Chain, brake.....		
2		Couplers		
4		Turnbuckles, 1½".....		
		Paint materials.....		
		Labor:		
		Lumber yard.....		
		Mill.....		
		Blacksmith.....		
		Bolt room.....		
		Iron machine		
		Car builders		
		Painters.....		
		General labor.....		
		" expense.....		
		RECAPITULATION.		
		Materials.....		
		Labor.....		
		General expense.....		

30 TON GONDOLA



30 TON GONDOLA CAR.

GENERAL DIMENSIONS.

Length over end sills..... 34′ 0″
" inside coal box..... 31 6
Width over side sills..... 8 9
" inside coal box..... 8 3
Height " " " 3 6
" from top of rail to center of draw-bar..... 2 10½
Couplers, M. C. B. Standard.
Brakes, " " " " without air, plated beams.
Draw gear, pocket attachment.
Bolsters, wood, trussed.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
2	Side sills	Pine.	5 ″x12 ″ x 34′ 0 ″	5½″x12½″ x 34′ 0 ″	364
2	Intermediate sills	"	5 x 9 x 32 11	5¼ x 9¼ x 34 0	275
2	Center sills	"	5 x 9 x 32 11	5¼ x 9¼ x 34 0	275
8	Side boards	"	3 x10½ x 32 8	3¼ x10⅝ x 34 0	792
8	End "	"	3 x10½ x 8 3	3¼ x10⅝ x 8 6	198
	Flooring,	"	1⅝ x5½″to9½″x8′11	2″x6″to10″x9 0	720
2	End sills	Oak.	8 x 9 ″ x 9′ 3	8¼″x 9½″ x 9 6	121
2	Cross-ties	"	4 x11 x 8 9	4¼ x11¼ x 9 0	72
10	Stakes	"	4¼ x 4¼ x 4 7½	4½ x 4½ x 4 9	80
4	" at cross-ties	"	4¼ x 4¼ x 5 2½	4½ x 4½ x 5 6	37
4	Side-board cleats	"	1⅝ x 4 x 3 6	2 x 4¼ x 3 6	10
					2944
	Draw Gear.				
4	Draw timbers	Oak.	5 ″x 9 ″ x 4′ 10½″	5¼″x 9½″ x 5′ 3 ″	85
2	" " fillers	"	9 x 9¼ x 1 7¼	9¼ x 9½ x 2 0	29
2	Buffer blocks	"	6¼ x 8 x 2 4	6½ x 8¼ x 2 9	25
4	Nut locks	"	⅞ x 2⅜ x 1 11⅛	1 x 3 x 2 0	C'gs
					139
	Bolsters.				
4	Body bolster members	Oak.	6½″x 8 ″ x 8′ 9 ″	6⅝″x 8½″ x 9′ 0 ″	167
2	King bolt blocks	"	8 x 9¼ x 1 4	8¼ x 9½ x 1 6	20
					187
	Brakes.				
4	Brake hanger blocks	Oak.	4 ″x 9 ″ x 1′ 10⅜″	4¼″x 9½″ x 2′ 0 ″	26
4	Brake beams	"	4 x 7 x 5 7	4¼ x 7¼ x 5 9	59
1	Floating lever fulcrum block	"	4 x 6 x 1 7¼	4¼ x 6¼ x 1 9	4
					89
				Total	3359

30-TON GONDOLA CAR.—Continued.

CASTINGS.

Pcs	Patterns.	Description.	Material.	Wt.
8	.....	Body truss rod washers	Gray Iron.	46
8	.....	" " rod bearings	" "	120
14	.....	" stake pockets	" "	154
36	.....	" round washers, ¾" bolt	" "	24
16	.....	Body round washers, ⅝" bolt	" "	6
				350
		Draw Gear.		
4	.....	Draw bar stops, rear	Gray Iron.	78
4	.....	" " " front	" "	68
4	.....	" timber guards	" "	22
8	.....	" timber keys	" "	36
16	.....	Cup washers, ⅞" bolt	" "	24
8	.....	Plain " ⅞" "	" "	8
				236
		Bolsters.		
4	.....	Bolster truss rod washers	Gray Iron.	80
2	.....	Body center plates	" "	132
4	.....	" side bearings	" "	66
4	.....	" truss rod saddles	" "	66
4	.....	" & bolster truss rod saddles	" "	106
16	.....	Plain washers, ¾" bolt	" "	13
				463
		Brakes.		
8	.....	Brake heads, M. C. B. Christie	Gray Iron.	152
8	.....	Brake shoes	" "	148
1	.....	" hand-wheel	" "	19
1	.....	" ratchet-wheel	" "	7
1	.....	" pawl	" "	3
1	.....	" shaft bearing	" "	3
8	.....	Plain washers, ⅝" bolt	" "	3
8	.....	Cup " 1" "	" "	16
				351
			Total	1400

30 TON GONDOLA CAR—(Continued.)

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
1		1	12	Side Board Hook Bolts.....	2 "x ½"x9" & ¾"x4'7¼"	113
1		1	4	End " " "	2 x ½ x9 & ¾ x4 4¼	36
	P	2	10	Stake Pocket U Bolt.....	¾ x 2' 3⅜"	35
	P	2	4	" " " "	¾ x 2 3⅜	14
			14	" " " " W'shrs.	2 x ¼ x 8½	17
1		1	8	Strap Bolts, side and end sill	2 x ½ 1 1½	30
			2	King Bolts.....	1¾ x 2 4	37
			2	" " covers.....	6 x ¼ 6	5
			2	Sill Steps.....	2 x ½ 2 10	19
			4	Grab Iron on each end	⅝ x 1 11½	8
			2	" " " side boards ...	⅝ x 2 5½	5
			4	Clip washers on side sill ...	2½ x ⅜ 7	7
			8	Truss rod guards.....	¼ x 5	1
						327
					Bolts and rods	783
						1110
				Draw Gear:		
			1	Draw bar carry iron	3 "x ⅞"x 2' 8 "	23
			1	" " " "	3 x ⅞ x 1 11	17
			2	" " buffer plates ...	3 x ¾ x 2 4	36
			2	" " pockets	4 x1 x 3 7¾	98
			2	" " uncoupling rods	1 x 5 3	27
			4	" " follower plates	6 x1½ x 9	90
			8	" " " " gds	2 x ⅝ x 1 3½	43
						334
					Bolts and rods	161
						495
				Bolsters:		
			2	Plates on bolsters..... ...	5½"x ⅛"x 1' 8 "	8
			4	Bolster truss straps	4 x ½ x 5 6	147
						155
					Bolts and rods	217
						372
				Brakes:		
			4	Brake beam plates.....	4 "x ¼"x 5' 6¾"	74
			8	" " guides.....	⅞ x 0 10½	14
			8	" shoe keys	⅞ x ½ 0 10	10
		2	8	" lev'r fulcr's, 1" shank	2½ x ¾ x 11	46
			4	" " fulcrum washer	3 x ¼ x 0 3	3
	1	1	8	" safety h'ger hook bolt	⅝ x 0 9	6
			8	" " " } 21¾" links	½ x 2 ½	11
			8	" " " { inside ...	½ x 1 5½	8
	2	1	8	" " " eye bolt...	⅝ x 1 2	9
			8	" hanger } 20½" } loop.	⅞ x 2 2	35
			8	" " { inside { shank	1 x 1 5	30
Cup	1	1	8	" " eyebolt.....	1 x 1 7	33
					Carried forward	279

30 TON GONDOLA CAR—(Continued).

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				BRAKES—(Continued.)	Brought forward.	279
			2	Live levers, 8″ & 24″ ctrs	4″ x1 ″ x 2′ 6 ″	67
			2	Dead " 7″ & 21″ ctrs	4 x1 x 2 2	58
			8	Lower connection { jaws	2½x ¾ x 0 9	38
			2	7′ 2½″ ctrs. { rod	¾ x 6 ½	18
		cot.	18	Connection pins	1⅛ x 0 4½	22
			4	Dead lever guide { jaws	2½x ½ x 1 6	25
			2	3′ 3¼″ from center { rod	¾ x 2 4	7
	2	1	2	to inside eye. { eye bolt.	⅞ x 2 1	8
			4	Upper connection brake- { jaws	2½x ¾ x 0 9	19
			1	end 12′ 9½″ centers { rod	¾ x11 7½	17
			4	Upper connection opp'te { jaws	2½x ¾ x 0 9	19
			1	end 10′ 5¼″ centers { rod	¾ x 9 3¼	14
			4	Cylinder connection { jaws	2½x ¾ x 0 9	19
			1	7′ 8¾″ centers { rod	¾x 6 6¾	10
			2	Hand brake connection, { jaws	2½x ¾ x 0 9	9
			1	13′ ½″ ctr. to ins. hook { rod	¾ x13 ½	20
			1	Cylinder lever 20, 9 & 7″ centers	3½x1 x 2 11	34
			1	Floating lever 6½ & 14½″ centers	3½x1 x 1 10	21
			3	Lever guides	1 x 3 7	28
			1	Floating lever fulcrum {	2½x ½ x 2 4¼	10
			1	" " " {	2½x ½ x 1 0	4
		1	1	Brake Shaft { Threaded ¾″	1½ x 1 3	7
			1	" " { on top	1¼ x 3 0	12
			1	" " ratchet key	⅜x ⅜ x 0 2½	1
			1	" " bracket	4 x ½ x 1 0	7
						773
					Bolts and Rods	38
						811

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	8	Cross ties, sills, truss rod bearing	¾″x 1′ 10¾″	34
1	1	1	4	" and side sills	¾ x 1 10¾	
1		1	16	Strap bolts and side sills	⅝ x 0 8⅜	11
	1	1	2	Sill steps and side sills	⅝ x 1 3¼	3
	1	1	2	" " side and end sills	⅝ x 1 3½	3
	1	1	2	Side and end sills	⅝ x 1 3	3
			8	Grab irons and end sills, lags	½ x 0 4¾	2
1		1	4	Body truss rods	1¼ x17 7	288
1		1	4	" " "	1¼ x18 1	296
2		2	4	End tie rods	¾ x 8 11¾	54
		1	4	Grab iron and side plank, B. H	½ x 0 5	1
	1	1	128	Stakes and side plank, B. H	½ x 0 8¾	61
	1	1	24	Cleats and " " "	½ x 0 6¼	9
		1	16	Strap bolts and side plank	½ x 0 5⅞	5
			8	Truss rod bearings and crosstie, lag	¾ x 5½	6
	1	1	16	Cleats and end plank	½ x 8½	7
						783

30 TON GONDOLA CAR—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				Draw Gear:		
Cup	1	2	16	Draw timber and sills	7/8"x1' 11 1/4"	62
1		2	8	" " and buffers	7/8 x1 7 5/8	26
	2	1	4	" " tie bolts	3/4 x1' 10 3/4	11
	1	1	24	" " and stops	3/4 x0 8 3/4	26
		2	8	" " " and guides	7/8 x0 11 3/4	16
			8	Uncoupling rod lags	1/2 x0 4 1/4	2
			4	Drawbar pocket rivets	1 1/8 x0 11 1/2	13
			4	Buffer plate lags	5/8 x0 5 1/4	2
	1	1	4	" " bolts	5/8 x0 8	3
						161
				Bolsters:		
1	1	1	8	Bolster and side sills	3/4"x1' 6 1/4"	18
1	1	1	8	" and int. "	3/4 x1 6 1/4	18
		1	8	" " center "	3/4 x1 6 3/4	19
1		1	8	" truss bolts 1 1/2" ends	1 1/4 x3 9	120
			8	" " strap rivets	1 x0 5	9
			12	" and side bearing, lags	5/8 x 5 1/4	5
	2	1	12	Tie bolts	3/4 x1 7	28
						217
				Brakes:		
	1	1	16	Brake beam and plates, C. B.	1/2"x0' 5 1/2"	5
	1	2	8	" " and head	3/4 x0 10 1/8	10
2		2	4	" hanger block tie rod	5/8 x2 7 1/8	11
	2	1	2	Floating lever fulcrum block and sills	5/8"x1' 4 7/8"	3
	1	1	4	Floating lever fulcrum to cross tie and block	1/2"x0' 6 1/2"	1
			2	Floating lever fulcrum rivets	3/4 x0 4	1
			12	Lever guides to cross tie and sills, lags	1/2"x0' 4 3/4"	3
	1	1	2	B'ke shaft bracket to end sill	5/8 x1 1 3/8	2
			2	" guide " " " lag	1/2 x0 4 3/4	1
			1	" pawl " " " "	3/4 x0 8	1
						38
					Summary:	
					Body	1110
					Draw Gear	495
					Bolsters	372
					Brakes	811
					Total	2788

30 TON GONDOLA CAR—(Continued.)

MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
2	Draw Springs, Penna. "X" pattern, capacity 19,000 lbs.	.....	.....
4	Turnbuckles, 1½" Tap	....	.....
	Nails, 20d cut, for floor	.....	34
8	Screws, for king bolt covers	2" No. 16	.....
2	Couplers, M. C. B. complete with necessary uncoupling rod brackets, clevises and pins	.....	.....

U. S. STANDARD SQUARE NUTS.

	1½"	1"	⅞"	¾"	⅝"	½"	⅜"		
Body	8	....	....	72	22	188	....	.....	49¼
Drawgear	....	....	64	28	4	....	....	.....	31½
Bolster	8	....	....	36	....	....	....	.....	22¼
Brake	....	16	2	17	28	22	....	.....	16¼
Total	16	16	66	153	54	210	....	.....	119¼

WROUGHT WASHERS.

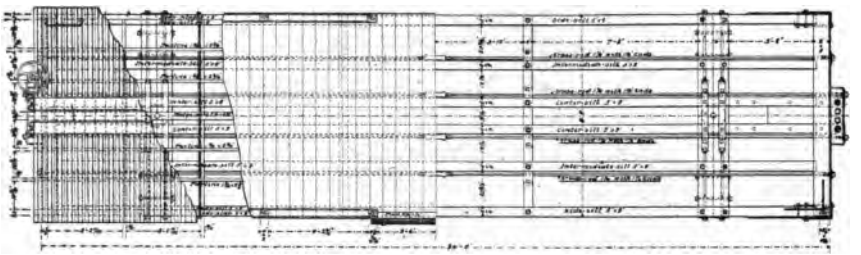
Body	....	....	....	12	6	168	....	.....	5½
Drawgear	....	....	16	32	4	....	....	.....	4
Bolster	....	....	....	40	....	....	....	.....	5½
Brake	....	8	4	10	30	20	....	.....	8
Total	....	8	20	94	40	188	....	.....	23

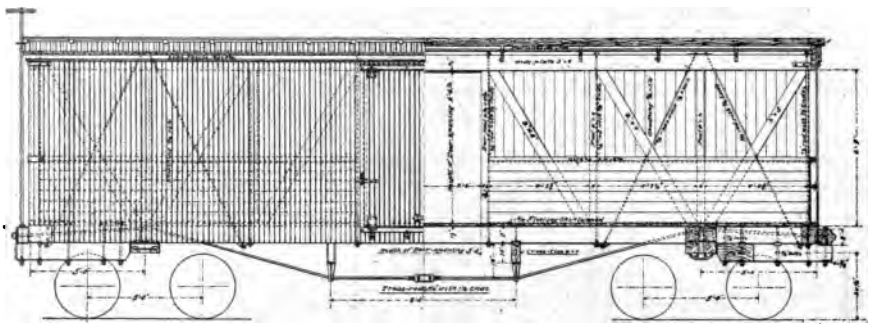
	Paint materials	.....	.....
1	Brake chain, ⅜" short link, 24" long from inside of eye bolt to inside of end link	⅜"x24 "	3
19	Spring cotters	⅜ x2¼	.....

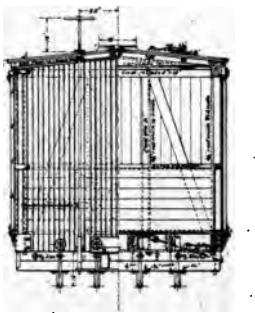
30-TON GONDOLA—Continued.

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
914	feet.	Lumber, pine, sills, etc		
792	"	" sideboards		
198	"	" end boards		
720	"	" flooring		
735	"	oak		
3,359	"			
		Kiln drying		
1,400	lbs.	Castings, gray iron		
2,788	"	Wrought iron		
119¼	"	Square nuts		
23	"	Wrought Washers		
34	"	Nails, cut		
8		Screws		
2		Draw springs		
19		Cotters		
3	lbs.	Chain, brake		
2		Couplers		
4		Turnbuckles, 1½"		
		Paint materials		
		Labor:		
		Lumber yard		
		Mill		
		Blacksmith		
		Bolt room		
		Iron machine		
		Car builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		







30 TON BOX CAR

30 TON BOX CAR.

GENERAL DIMENSIONS.

Length over end sills	34′	0″
" inside in the clear	33	4½
Width over side sills	8	9
" inside in the clear	8	1½
" of door opening	5	0
Height between sill and plate	6	9
" inside in the clear	6	11½
" of door opening	6	6½
" top of rail to center drawbar	2	10½

Couplers, M. C. B. Standard.
Brakes, " " without air, plated beams.
Draw gear, pocket attachment.
Bolsters, wood trussed.
Brake beam, oak, plated.
Roof, double board.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
	Body:				
2	Side sills	Pine.	5 "x 9 "x32′11 "	5½"x 9½" x 34′ 0"	275
2	Center sills	"	5 x 9 x32 11	5½ x 9½ x 34 0	275
2	Intermediate sills	"	5 x 9 x32 11	5½ x 9½ x 34 0	275
48	Flooring	"	1¾ x 7¼ x 8 8¾	2 x 8 x 9 0	576
9	" across door	"	1¾ x 7¼ x 8 10⅜	2 x 8 x 9 0	108
2	Side plates	"	3 x 8 x34 0	3½ x 8½ x 34 0	152
28	Inside lin'g, sides	"	13/16 x 5½ x13 11⅝	1 x 6 x 14 0	196
14	" " ends	"	13/16 x 5½ x 8 3	1 x 6 x 9 0	63
...	Furring over sid'g	"	11/16 x 1¾ x70 Lin.	1 x 2 x 70 0	12
132	Sheathing, sides	"	13/16 x 5½ x 8 0	1 x 6 x 8 0	528
23	" over doors	"	13/16 x 5½ x 0 8	1 x 6 x 1 0	12
23	" under "	"	13/16 x 5½ x 0 9	1 x 6 x 1 0	12
40	" ends	"	13/16 x 5½ x 8 6	1 x 6 x 9 0	180
...	Grain strips	"	2¾ x 2¾ x60 Lin.	3 x 3 x 60 0	45
4	Corner strips	"	⅞ x ⅞ x 3 4	1 x 1 x 3 6	1
2	End sills	Oak.	8 x 9 x 8 9	8¼ x 9¼ x 9 0	114
2	Cross ties	"	4 x11 x 8 9	4¼ x11¼ x 9 0	72
4	Door-post	"	4½ x 4¾ x 7 0	4¾ x 5 x 7 3	57
4	Corner-post	"	4½ x 5¼ x 7 0	4¾ x 5½ x 7 3	63
8	Intermediate-post	"	3 x 4 x 7 0	3¼ x 4¼ x 7 3	67
2	Ladder cripples	"	3 x 4 x 2 3	3¼ x 4¼ x 2 6	6
2	" "	"	3 x 4 x 3 4½	3¼ x 4¼ x 3 6	8
4	End posts	"	3 x 4 x 7 0	3¼ x 4¼ x 7 3	33
8	Braces, side	"	3 x 5 x 8 1	3¼ x 5¼ x 8 3	94
4	" corner	"	3 x 5 x 8 1	3¼ x 5¼ x 8 3	47
4	" end	"	3 x 5 x 7 3½	3¼ x 5¼ x 7 6	43
2	End plates	"	3 x13 x 8 5	3¼ x13¼ x 8 6	61
4	Girth, side	"	2½ x 3⅞ x13 11⅝	2¾ x 4¼ x 14 0	61
2	" end	"	2½ x 3⅞ x 8 3	2¾ x 4¼ x 8 6	17
2	Grab iron cripples	"	3 x 4 x 1 11½	3¼ x 4¼ x 2 0	5
2	" " "	"	3 x 4 x 2 2¾	3¼ x 4¼ x 2 3	5
					3463

30 TON BOX CAR—(Continued.)

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
	Draw Gear.				
4	Draw timbers	Oak.	5 "x 9 "x 4′ 10½"	5¼"x 9¼"x 5′ 3"	85′
2	" " . fillers	"	9 x 9¼ x 1 7¼	9¼ x 9½ x 2 0	29
2	Buffer blocks	"	5 7/16 x 8 x 2 4½	5¾ x 8¼ x 2 9	22
4	Nut locks	"	⅞ x 2⅜ x 1 11¾	Cuttings	..
					136′
	Bolsters.				
4	Bolster members.	Oak.	6½"x 8 "x 8′ 9 "	6¾"x 8¼"x 9′ 0"	167′
2	King-bolt blocks.	"	8 x 9¼ x 1 4	8¼ x 9½ x 1 6	20
					187′
	Brakes.				
1	Fulcrum block...	Oak.	4" x 6" x 1′ 7¼"	4¼"x 6¼"x 1′ 9"	4′
4	Brake beams.....	"	4 x 7 x 5 7½	4¼ x 7¼ x 5 9	59
4	" hanger bl'ks	"	4 x 9 x 1 10⅜	4¼ x 9¼ x 2 0	26
					89′
	Roof:				
9	Carlines	Oak.	1¾ "x9 "x 8′ 5 "	2 "x 9¼"x 8′ 9"	122′
4	Purlines	Pine.	1¾ x2¾ x34 0	2 x 3 x34 6	69
1	Ridge pole.....	"	2¼ x3½ x34 0	2½ x 3¾ x34 6	27
1	Running board..	"	1¾ x5¾ x35 2⅝	2 x 6 x36 0	36
2	Running boards..	"	15/16 x5¾ x34 2⅝	1 x 6 x36 0	36
2	Facia, sides.....	"	1¾ x3¾ x34 5⅛	2 x 4 x35 0	47
4	" ends.....	"	1¾ x3¾ x 4 6	2 x 4 x 5 0	13
152	Roofing, upper...	W."	13/16 x5½ x 4 9	1 x 6 x 5 0	380
152	" lower...	W."	13/16 x5½ x 4 9	1 x 6 x 5 0	380
18	Run'g b'd sad'les	"	1¾ x2½ x 2 2	2 x 2¾ x 2 6	C't'gs.
2	" " cleats.	Oak.	1¾ x4¾ x 1 11	2 x 6 x 2 0	4
					1114′
	Door:				
2	Top rails.....	Pine.	⅞ "x7¾"x 5′ 3"	1 "x 8 "x 6′ 0"	8′
2	Center rails.....	"	⅞ x7¾ x 5 3	1 x 8 x 6 0	8
2	Bottom rails.....	"	⅞ x9¾ x 5 3	1 x10 x 6 0	10
8	Stiles	"	⅞ x5¾ x 2 4⅜	1 x 6 x 2 6	10
4	Braces	"	⅞ x5¾ x 3 2½	1 x 6 x 3 6	7
25	Sheathing	"	13/16 x5¼ x 6 10	1 x 6 x 7 0	88
2	Top track fur'ing	Oak.	2 9/16 x2¾ x10 8	3 x 3 x11 0	17
2	Closed stops.....	"	2⅛ x2½ x 7 3	2¼ x 2¾ x 7 6	8
2	Headers	Pine.	¾ x4¾ x 5 0	1 x 6 x 5 0	5
					161′
				Summary:	
				Body	3463′
				Drawgear	136
				Bolsters	187
				Brake	89
				Roof.....	1114
				Door	161
				Total	5150′

30 TON BOX CAR.—(Continued.)

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Wt.
		Body.		
4	.....	Body trussrod washers, buffer block	Gray iron.	20
4	.....	" " " end sill	" "	26
8	.....	" " bearings	" "	120
8	.....	Diagonal brace rod washers	" "	40
8	.....	Plain washers. ⅞"	" "	8
4	.....	" " ¾"	" "	3
				217
		Draw Gear.		
4	.....	Drawbar stops, rear	Gray iron.	78
4	.....	" " front	" "	68
4	.....	" timber guard	" "	22
8	.....	" " keys	" "	36
16	.....	Cup washers, ⅞" bolt	" "	24
8	.....	Plain " ⅞" "	" "	8
				236
		Bolsters.		
4	.....	Bolster trussrod washers	Gray iron.	80
2	.....	Body center plates	" "	132
4	.....	" side bearings	" "	66
4	.....	" trussrod bear'g, intermediate sill	" "	66
4	.....	" " " center sill	" "	106
16	.....	Plain washers, ¾" bolt	" "	13
				463
		Brakes.		
8	.....	Brake heads, Christie	Gray iron.	152
8	.....	" shoes, "	" "	148
1	.....	" hand wheel	" "	19
1	.....	" ratchet	" "	7
1	.....	" pawl	" "	3
1	.....	" shaft bearing end sill	" "	3
1	.....	" " " girth	" "	3
1	.....	" " " roof	" "	11
8	.....	Plain washers, ⅝"	" "	3
8	.....	Cup " 1 "	" "	16
				365
		Door.		
14	.....	Bottom track brackets	Gray iron.	21
4	.....	Top guides	" "	12
4	.....	Bottom shoes	" "	24
2	.....	Open stops	" "	10
2	.....	Handles	" "	6
				73
			Summary:	
			Body	217
			Draw Gear	236
			Bolsters	463
			Brakes	365
			Door	73
			Total	1354

30 TON BOX CAR.—(Continued.)

FORGINGS.

C. W.	W.W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Kingbolt covers	6 "x ¼"x 6 "	5
			2	Sill Steps	2 x ½ x 2' 10	19
			2	Kingbolts	1¾ x 2 4	37
		1	4	Body truss rods, int. sill, 1½" ends	1¼ x 17 7	288
		1	4	" " " ctr. " 1½ "	1¼ x 18 1	296
			2	Grab irons, lower end 24" ctrs.	⅝ x 2 6	5
			1	" " upper " 24 "	⅝ x 2 6	3
			1	" " " brake end 18" ctrs	⅝ x 2 0	2
			2	" " roof, 24" ctrs.	⅝ x 2 6	5
			4	Running board brackets	2 x ¼ x 1 2	8
			10	Ladder irons, side, 20" ctrs.	⅝ x 2 6	25
			2	" " ends, offset 18" ctrs	⅝ x 2 6	5
			8	Truss rod guards	¼ x 0 5	1
		1(¾)	8	Strap bolts, side and end sill	2 x ½ x 1 2	31
		1(⅝)	4	" " " " " plate	2 x ½ x 0 10	11
			4	Corner bands, sills, 7½"x16½"	10 x ¼ x 2 0	67
			4	" " girths, 6 "x 7½"	3½ x ¼ x 1 1½	13
			4	" " plates, 7½"x13 "	2½ x ¼ x 1 8½	14
			4	Diagonal brace rod washers	3 x ¼ x 0 8	7
			16	Post rod plate washers	3 x ¼ x 0 3	10
						852
				Draw Gear:		
			1	Drawbar carry iron	3 "x ⅞"x 2' 8 "	23
			1	" " "	3 x ⅞ x 1 11	17
			2	" spring pockets	4 x1 x 3 7¾	98
			4	" follower plates	6 x1½ x 0 9	90
			8	" " guides	2 x ⅝ x 1 3½	43
			2	" buffer plates	3 x ¾ x 2 4½	36
			2	" uncoupling rods	1 x 5 3	27
						334
				Bolsters:		
			2	Protections	5½"x ⅛"x 1' 8 "	8
			4	Truss rod straps	4 x ½ x 5 6	147
						155
				Brakes:		
			4	Brake beam plates	4 "x ¼"x 5' 6¾"	74
			8	" " guides	⅞ x 0 10½	14
			8	" shoe keys	⅞ x ½ x 0 10	10
		2	8	" lever fulcrums, 1" shank	2½ x ¾ x 0 11	46
			4	" " " washer	3 x ¼ x 0 3	3
	1	1	8	" safety hanger hook bolt	⅝ x 0 9	6
			8	" " " } 21¾" links,	½ x 2 ½	11
			8	" " " } inside	½ x 1 5½	8
	2	2	8	" " " eye bolt	⅝ x 1 2	9
			8	" hangers } 20½" loop	⅞ x 2 2	35
			8	" " } inside shank	1 x 1 5	30
Cup	1	1	8	" " eye bolt	1 x 1 7	33
			2	Live levers, 8" & 24" ctrs.	4 x1 x 2 6	67
			2	Dead " 7" & 21" "	4 x1 x 2 2	58
					Carried forward..	404

FORGINGS—(Continued.)

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				Brakes—Continued.	Brought forward..	404
			8	Lower connections } jaws...	2½" x ¾"x 0' 9 "	38
			2	7' 2½" centers. } rod....	¾ x 6 ½	18
		Cot.	18	Connection pins.....	1⅛ x 0 4½	22
			4	Dead lever guides } jaws....	2½ x ½ x 1 6	25
			2	3' 3¼" from center to } rod.....	¾ x 2 4	7
	2	1	2	inside eye } eye bolt.	⅞ x 2 1	8
			4	Upper connections, brake } jaws.	2½ x ¾ x 0 9	19
			1	end 12' 9½" centers. } rod .	¾ x11 7½	18
			4	Upper connections opp'te } jaws.	2½ x ¾ x 0 9	19
			1	end 10' 5¼" centers ..... } rod .	¾ x 9 3¼	14
			4	Cylinder connections } jaws.	2½ x ¾ x 0 9	19
			1	7' 8¾" centers. } rod .	¾ x 6 6¾	10
			2	Hand brake connections } jaws.	2½ x ¾ x 0 9	9
			1	13' 1½" ctr. to ins. hook } rod .	¾ x13 ½	20
			1	Cylinder lever 20" 9" & 7" ctrs.	3½ x 1 x 2 11	34
			1	Floating lever, 6½"x14½" ctrs .	3½ x 1 x 1 10	21
			3	Lever guides.....	1 x 3 7	28
			1	Floating lever fulcrum }	2½ x ½ x 2 4¼	10
			1	" " " }	2½ x ½ x 1 0	4
		1	1	Brake shaft } Threaded ¾".....	1½ x 1 3	7
			1	" " } on top.....	1¼ x 9 9	39
			1	" " Ratchet key	⅜ x ⅜ x 0 2½	1
						794
				Door:		
			2	Thresholds.....	3½"x ¼"x 5' 0 "	29
			2	Top guides.....	2½ x ¼ x10 8	44
			2	Bottom tracks.....	2 x ½ x10 8	71
			2	Hasps.....	2 x ⅜ x 0 8	3
		1	2	" eye bolts.....	1½ x ½ x 4½	2
			2	" staples.....	⅜ x 0 6	
			2	" pins.....	½ x 0 4	1
			2	" " chain staple.....	⅛ x 0 2½	
						150

RODS AND BOLTS.

				Body:		
C	P	2	4	Corner post rods, 7/16" ends....	¾" x 8' 5 5⅝"	50
C	1	2	4	Door " " ⅞ "	¾ x 8 5 5⅝	50
C	P	2	4	Side " " ⅞ "	¾ x 8 5 5⅝	50
1	1	2	4	End " " ⅞ "	¾ x 8 8⅞	51
C	P		8	Brace rods, B. H. & ⅞ "	¾ x 9 7	115
	P	2	2	Girth tie rods.....	⅝ x 9 ½	18
	T 8	2	6	Plate carline rods.....	⅝ x 8 10¾	53
		1	16	Cor'r b'nds, strap bolts & side sill	⅝ x 9	12
			8	" " end sill at side, lags.	½ x 4¾	3
			4	" " and side girth, "	½ x 4¾	1
		1	4	" " and end " C. B.	⅝ x 6⅝	2
			8	" " side plate & strap bolt	½ x 6⅜	3
			4	" " and end plate, lags ..	½ x 4¾	1
					Carried forward....	408

RODS AND BOLTS.—(Continued).

C. W.	W. W.	Nuts.	Pos.	Description.	Size of Blank.	Wt.
				Body.—Continued.	Brought forward	408
		1	4	Ladder rounds to cripple post, C B	½" x 5⅝"	1
		1	6	" " " " lin'g, "	½ x 6½	2
			10	" " " corner post, lag	½ x 4¾	3
		1	4	Grab iron to roof on purl, C B	½ x 5⅝	1
		1	4	" " " end girth, "	½ x 6½	1
		1	4	" " " cripples & lin'g, "	½ x 6½	1
		1	2	" " " step corners	½ x 6½	1
			2	" " " " " lag	½ x 4¾	1
		1	4	Run'g boards & brackets, C B	½ x 4⅜	1
			4	" " " to end p'te, lag	½ x 4⅜	1
T4	1	1	12	Cross tie to sills	¾ x1 10¾	33
			8	" " " strutts, lags	¾ x0 6	6
			4	Sill step to side and end sill, lag	⅝ x0 5¾	2
						462
					Forgings	852
						1314
				Draw Gear.		
			4	Drawbar pocket rivets	1⅛"x0' 11½"	13
Cup	1	2	16	Draw timber and sills	⅞ x1 11¼	62
1		2	8	" " " buffer blocks	⅞ x1 7⅝	26
	2	1	4	" " tie bolts	¾ x1 10¾	11
	1	1	24	" " and stops	¾ x0 8¾	26
		2	8	" stops and follower guides	⅞ x0 11¾	16
	1	1	4	Buffer plate and buffer blocks	⅝ x0 8	3
			4	" " " " lags	⅝ x0 5¾	2
			8	Uncoupling rod castings	½ x0 4¼	2
						161
					Forgings	334
						495
				Bolsters:		
		1	8	Truss bolts, upset 1¼x3 & 6, 1½" head	1¼"x3' 9 "	120
1	1	1	8	Bolster and side sill	¾ x1 6¼	18
1	1	1	8	" " int. "	¾ x1 6¼	18
		1	8	" " ctr. "	¾ x1 6¾	19
	2	1	12	" tie bolts	¾ x1 7	28
			12	" and side bearing, lag	⅝ x0 5¾	5
			8	Rivets for truss rod strap	1 x0 5	9
						217
					Forgings	155
						372

BOLTS AND RODS.—(Continued.)

C. W.	W.W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				Brakes:		
	1	1	16	Brake beam and plates, C. B	½″ x 0′ 5½″	5
	1	2	8	" " " head	¾ x 10⅛	10
2		2	4	" hanger block tie rod	⅝ x 2 8⅞	11
	2	1	2	Fl'ting lever fulcrum bl'k & sills	⅝ x 1 4⅞	3
	1	1	4	Floating lever fulcrums to cross tie and block	½ x 0 6½	1
			2	Floating lever fulcrum rivets	¾ x 0 4	1
			12	Lever guides to cross ties and sills, lags	½ x 0 4¾	3
	1	1	2	Brake shaft bracket to end sill	⅝ x 1 1⅜	2
		2		" " guide " " "	½ x 0 4¾	1
	1		1	" " pawl " " "	¾ x 0 8	1
			2	Mid. brake shaft guide, lag	½ x 4¾	1
			1	Roof " " " "	⅝ x 6¼	1
	1	1	2	" " " "	⅝ x 6¾	1
						41
					Forgings	794
						835
				Door:		
	1	1	14	Top guide to plate	½″ x 8½″	7
	1	1	14	Bottom track and sill	½ x 9¼	7
	1		4	Closed stop and door post, lag	½ x 6¼	1
		1	2	Open stop and girth, C. B	½ x 6½	1
		1	16	Shoes and doors, C. B	⅜ x 3⅜	2
						18
					Forgings	150
						168
					Summary:	
					Body	1314
					Draw gear	495
					Bolster	372
					Brakes	835
					Doors	168
					Total	3184

30 TON BOX CAR—(Continued.)

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
2	Draw springs, Penna. "X", 19,000 lbs. capacity		
4	Turnbuckles, open, pressed. 1½"		
2	Couplers, M. C. B., automatic, complete with uncoupling rod brackets, clevises, etc		
1	Brake chain, with long link and eyebolt	⅜"x24 "	3
19	Spring cotters for connection pins and brake shaft	⅜"x 2¼"	
	Screws.		
12	Bottom door track bracket	2½" No. 16.	
24	Door threshold	1¾ " 16.	
16	" guides	1¾ " 16.	
12	" handles	1¾ " 16.	
8	Kingbolt covers	1½ " 16.	
72			
	Body Nails.		
1240	Sheathing to side sills and plates	3 " No. 9, B.W.	18
320	" " end " " "	2½ " 10, "	3¼
516	" " girths	2 " 11, "	3¼
832	Lining and girths to posts, braces, etc	2 " 11, "	5½
72	Fascia to sides and ends	40 d Cut.	5
805	Flooring to sills, grain strips, cripples, etc.	20 d "	35
	Roof.		70
12	Purlines to carlines	4 " No. 6, B.W.	½
90	" and ridge pole to carlines	3¼ " 9, "	1¼
189	Running boards	2 " 11, "	1¼
1368	Lower roofing	2 " 11, "	8½
1368	Upper roofing	3¼ " 9, "	21½
76	Running board saddles	3¼ " 9, "	1¼
	Door.		34¾
396	Sheathing and battens	6 d clinch.	3½
		Total	104¼

U. S. STANDARD SQUARE NUTS.

	1½"	1"	⅞"	¾"	⅝"	½"	⅜"		
Body	8	....	40	20	40	36	....	....	41½
Draw Gear	....	....	64	28	4	....	....	....	31½
Bolster	8	....	....	36	....	....	....	....	22½
Brakes	....	16	2	17	30	22	....	....	16½
Door	....	....	....	....	....	32	16	....	3¼
Total	16	16	106	101	74	90	16	....	115

WROUGHT WASHERS.

Body	....	....	8	12	8	....	....	....	2¾
Draw Gear	....	....	16	32	4	....	....	....	5½
Bolster	....	....	....	40	....	....	....	....	4
Brake	....	8	4	10	32	20	....	....	5¾
Door	....	....	....	....	....	34	....	....	1½
Total	....	8	28	94	44	54	....	....	19½

Paint materials .....

30 TON BOX CAR—(Continued.)

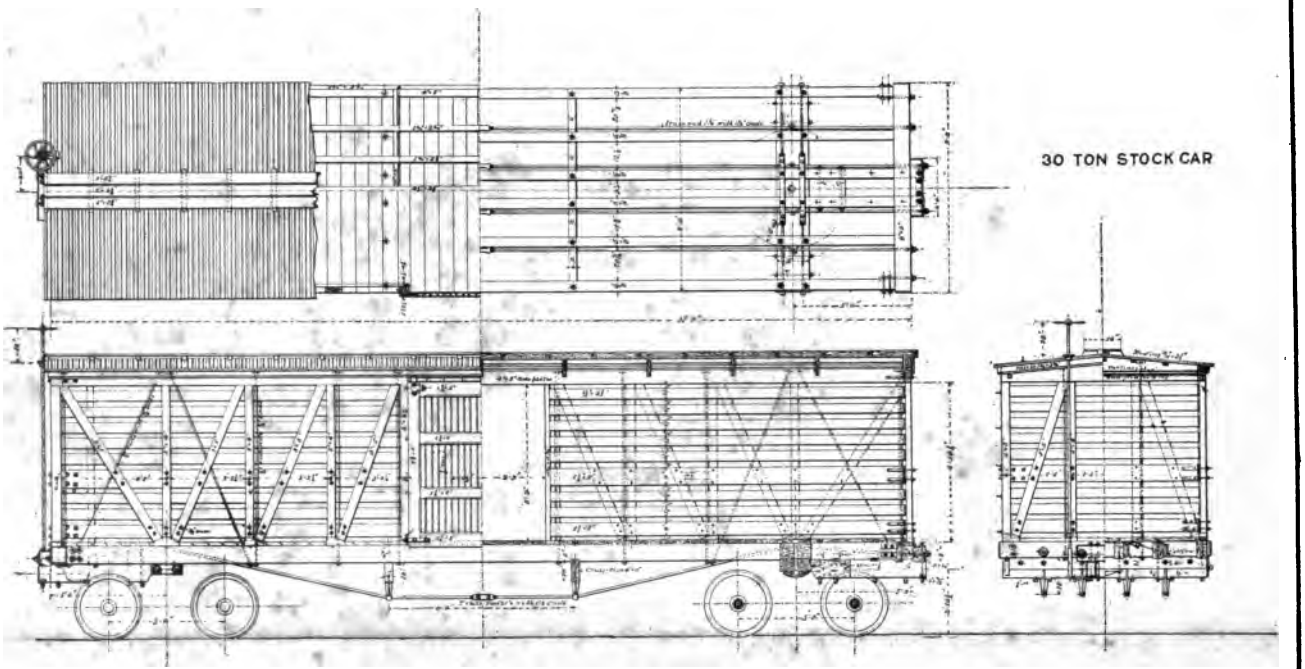
SUMMARY.

Quantity.		Specifications.	Price.	Amount.
1073	fcet.	Lumber, pine, sills, etc.....		
684	"	" flooring		
63	"	" misc. short...		
820	"	pine, siding..		
760	"	" roofing		
60	"	" fascia.....		
259	"	" lining		
72	"	" running bds..		
43	"	" door rails, etc.		
1316	"	oak.		
5150	"			
		Kiln drying		
1354	lbs.	Castings, gray iron.		
3184	"	Wrought iron		
115	"	Square nuts		
19½	"	Wrought washers.....		
40	"	Nails, cut		
64¾	"	" B. W		
3½	"	" clinch.		
72		Screws.		
2		Draw springs.....		
19		Cotters.....		
3	lbs.	Chain, brake.		
1½	feet.	" bright		
2		Couplers.		
4		Turnbuckles, 1½".....		
		Paint materials.....		
		Labor:		
		Lumber yard.....		
		Mill		
		Blacksmith.....		
		Bolt room.....		
		Iron machine.....		
		Car builders.....		
		Painters		
		General labor.....		
		" expense		
		RECAPITULATION.		
		Materials.		
		Labor.....		
		General expense.....		

THE.....

ESTIMATED COS.....

SPECIFICATION.	Brakes		Roof				Door				Remarks
	Amount		Quantity		Amount		Quantity		Amount		
Lumber—Pine Sills			96	ft.							
Pine Flooring											
" Misc. Short							5	ft.			
" Siding							88	"			
" Roofing			760	"							
" Fascia											
" Lining											
" Running Bds.			72	"							
" Door Rails							43	"			
Oak			126	"			25	"			
			1054	"			161	"			
Kiln Drying											
Castings—Gray							73	lbs.			
" Malleable											
" Steel											
" Brass											
Wrought Iron							168	"			
Metals											
Nuts—Square							$3\frac{1}{4}$	"			
" Hexagon											
Wrought Washers							$1\frac{1}{2}$	"			
Nails—Cut											
" Barbed Wire			$34\frac{3}{4}$	lbs.							
" Clinch							$3\frac{1}{2}$	"			
Screws							64				
Springs											
Gen. Mchse.—Cotters											
Brake Chain											
Bright Chain							$1\frac{1}{2}$	ft.			
Roof											
Couplers											
Turnbuckles, $1\frac{1}{2}$"											
Doors											
Grain Doors											
Brakes											
Pipes and Fittings											
Brake Beams											
Paint Materials											
Paper											
Hair Felt											
Trimmings											
Glass											
Upholstery											
Heaters—Stoves											
Freight—Express											
Labor: Lumber Yard											
Mill											
Blacksmith											
Bolt Room											
Iron Machine											
Car Builder											
Tinsmith											
Pipe Fitter											
Upholsterer											


30 TON STOCK CAR

GENERAL DIMENSIONS.

Length over end sills	37′	0	″
" inside in the clear	36	3	
Width over side sills	8	10	
" inside in the clear	8	1	
" of door opening	5	6	
Height between sill and plate	6	10¾	
" inside in the clear	7	0	
" of door opening	6	9	
" from top of rail to center of draw bar	2	10½	
Couplers, M. C. B. Standard, with pocket			
Brakes, " " without air			
Draw Gear, pocket attachment			
Bolsters, wood, trussed			
Brake beams, oak, plated			
Roof, double board			

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
	Body:				
2	Sills, side	Pine	5 ″x 9 ″x35′ 11 ″	5¼″x 9¼″ x36′ 0″	291′
2	" int	"	5 x 9 x35 11	5¼ x 9¼ x36 0	291
2	" ctr	"	5 x 9 x35 11	5¼ x 9¼ x36 0	291
	Flooring	"	1¾x5¼ to 9¼x8 10	2 x 6 to 10x 9 0	783
2	Side plates	"	4 x 6 x37 0	4¼ x 6¼ x38 0	168
4	Slats, side girth	"	1½ x 9 x15 2¼	1¾ x 9¼ x16 0	86
4	" " bottom.	"	1½ x 9 x15 2¼	1¾ x 9¼ x16 0	86
28	" " int	"	13/16 x 5½ x15 2¼	1 x 6 x16 0	224
2	" end girth	"	1½ x 9 x 8 4	1¾ x 9¼ x 9 0	24
2	" " bottom.	"	1½ x 9 x 8 4	1¾ x 9¼ x 9 0	24
14	" " int	"	13/16 x 5½ x 8 4	1 x 6 x 9 0	63
2	End sills	Oak	8 x 9 x 9 3	8¼ x 9¼ x 9 6	121
2	Cross ties	"	4 x11 x 8 10	4¼ x11¼ x 9 0	72
4	Corner posts	"	4 x 5 x 6 9½	4¼ x 5¼ x 7 0	52
4	Door "	"	4¾ x 4¾ x 6 9½	5 x 5 x 7 0	58
12	Int. "	"	3 x 4 x 6 9½	3¼ x 4¼ x 7 0	97
2	Lad'r crip'e p'sts	"	3 x 4 x 4 9	3¼ x 4¼ x 5 0	12
2	" " "	"	3 x 4 x 1 11	3¼ x 4¼ x 2 0	5
2	End plates	"	4 x13 x 8 10	4¼ x13¼ x 9 0	84
4	" posts	"	3 x 4 x 6 9½	3¼ x 4¼ x 7 0	32
16	Braces, side	"	3 x 5	3¼ x 5¼ x 8 0	182
4	" end	"	3 x 5	3¼ x 5¼ x 7 0	40
					3086′

30 TON STOCK CAR—(Continued.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
	Draw Gear.				
2	Buffer blocks	Oak.	6¼"x 8 "x 2' 4½"	6½"x 8¼"x2' 9"	25
4	Draw timbers	"	5 x 9 x 4 10½	5¼ x 9¼ x5 3	85
2	" " fillers	"	9 x 9¾ x 1 7¾	9¼ x10 x2 0	29
					139
	Bolsters.				
4	Body bolsters	Oak.	6½"x 8 "x 8' 10 "	6¾"x 8¼"x9' 0"	167
2	King bolt blocks	"	8 x 9¼ x 1 4	8¼ x 9½ x1 6	20
					187
	Brakes.				
1	Fulcrum block	Oak.	4 "x 6 "x 1' 7¼"	4¼"x6¼"x1'7¼"	4
4	Brake beams	"	4 x 7 x 5 7½	4¼ x7¼ x5 9	59
4	" hanger bl'ks	"	4 x 9 x 1 10⅜	4¼ x9¼ x2 0	26
					89
	Roof.				
9	Carlines	Oak.	1¾"x 9 "x 8' 5 "	2 "x9¼"x 8' 9"	122
4	Purlines	Pine.	1¾ x 2¾ x37 0	2 x3 x38 0	76
1	Ridge pole	"	2¼ x 3½ x37 0	2½ x3¾ x38 0	30
2	Running boards	"	1¾ x 5¾ x19 1¼	2 x6 x20 0	40
4	" "	"	⅞ x 5¾ x19 1¼	1 x6 x20 0	40
2	Fascia, side	"	1¾ x 3¾ x37 3½	2 x4 x38 0	51
4	" end	"	1¾ x 3¾ x 4 6⅞	2 x4 x 5 0	13
344	Roofing	W.Pine	13/16x 5½ x 4 9	1 x6 x 5 0	860
20	Run'ng bo'rd sad'l's	Oak.	1¾ x 2½ x 2 2	2 x2¾ x 2 6	Cut'g.
2	" " cleats	"	1¾ x 5½ x 1 6	2 x6 x 2 0	4
					1236
	Doors.				
2	Door stops	Oak.	2 "x2½"x 7' 4 "	2¼"x2¾"x 7' 6"	8'
2	" top rails	"	1¾ x8 x 5 3	2 x8¼ x 5 6	15
4	" center rails	"	1¾ x6 x 5 3	2 x6¼ x 5 6	23
2	" bottom rails	"	1¾ x8 x 5 3	2 x8¼ x 5 6	15
4	" stiles	"	1¾ x6 x 7 1½	2 x6¼ x 7 3	30
2	" stop blocks	"	3 x3½ x 1 3	3¼ x3¾ x 2 0	4
2	" cattle bars	"	1¾ x6 x 5 11	2 x6¼ x 6 0	13
2	" track fur'ng	"	2¾ x2¾ x 11 8	3 x3 x12 0	18
					126'
				Summary :	
				Body	3086'
				Draw Gear	139
				Bolsters	187
				Brakes	89
				Roof	1236
				Door	126
				Total	4863'

30 TON STOCK CAR.—(Continued).

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Wt.
		Body:		
4		Body tr'srod w'shs, buffer-bl'k	Gray Iron.	20
4		" " " end sill	" "	26
8		" " bearings	" "	120
8		Diagonal brace rod washers	" "	40
8		Plain washers, 7/8"	" "	8
4		" " 3/4"	" "	3
4		Corner post shoes	" "	50
4		Bolster post and brace shoes	" "	56
8		Int. " " " "	" "	72
4		Door post shoes	" "	26
4		End " "	" "	20
				441
		Draw Gear:		
4		Drawbar stops, rear	Gray Iron.	78
4		" " front	" "	68
4		" timber guards	" "	22
8		" " keys	" "	36
16		Cup washers, 7/8" bolt	" "	24
8		Plain washers, 7/8" bolt	" "	8
				236
		Bolsters:		
4		Bolster trussrod washers	Gray Iron.	80
2		Body center plates	" "	132
4		" side bearings	" "	66
4		Body trussrod saddles, int. sill	" "	66
4		" " " center sill	" "	106
16		Plain washers, 3/4" bolt	" "	13
				463
		Brakes:		
8		Brake heads, Christie	Gray Iron.	152
8		" shoes, "	" "	148
1		" hand wheel	" "	19
1		" ratchet	" "	7
1		" pawl	" "	3
1		" shaft bearing, end sill	" "	3
1		" " " girth	" "	3
1		" " " roof	" "	11
8		Plain washers, 5/8"	" "	3
8		Cup " 1"	" "	16
				365
		Door:		
2		Open stops	Gray Iron.	10
2		Door handles	" "	6
				16
			Summary:	
			Body	441
			Draw gear	236
			Bolsters	463
			Brakes	365
			Door	16
				1521

30 TON STOCK CAR.—(Continued.)

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				Body:		
		1	8	Strap bolts, side and end sill	2 " x ½" x 1' 1½"	30
	1	1	16	" " bottom slats	1¾ x ⅜ x 11	32
	1	1	16	" " girth "	1¾ x ⅜ x 11	32
			2	King bolts	1¾ x 2 4	37
			2	King bolt covers	6 x ¼ x 0 6	5
			2	Sill steps	3 x ½ x 2 10	19
			2	Grab irons, lower end 24" centers	⅝ x 2 6	5
			1	" " upper " 24" "	⅝ x 2 6	3
			1	" " " brake end, 18" centers	⅝ x 2 0	2
			2	Grab irons, roof, 24" centers	⅝ x 2 6	5
			10	Ladder irons, side, 20" centers	⅝ x 2 6	25
			2	" " ends, offset 18" ctr.	⅝ x 2 6	5
			4	Diagonal brace rod washers	2 x ⅜ x 1 0	10
			6	Carline rod staples	3/16 x 0 6	1
			4	Running board brackets	2 x ¼ x 1 2	8
						219
				Draw Gear:		
			1	Draw bar carry iron	3 " x ⅞" x 2' 8 "	23
			1	" " " "	3 x ⅞ x 1 11	17
			2	" " spring pockets	4 x1 x 3 7¾	98
			4	" " follower plates	6 x1½ x 0 9	90
			8	" " " guides	2 x ⅝ x 1 3½	43
			2	" " buffer plates	3 x ¾ x 2 4½	36
			2	" " uncoupling rods	1 x 5 3	27
						334
				Bolsters:		
			2	Protections	5½" x ⅛" x 1' 8 "	8
			4	Truss rod straps	4 x ½ x 5 6	147
						155
				Brakes:		
			4	Brake beam plates	4 " x ¼" x 5' 6¾"	74
			8	" " guides	⅞ x 0 10½	14
			8	" shoe keys	⅞ x ½ x 0 10	10
		2	8	" lever fulcrums, 1" shank	2½ x ¾ x 0 11	46
			4	" " " washers	3 x ¼ x 0 3	3
	1	1	8	" safety hanger hook bolts	⅝ x 0 9	6
			8	" " " } 21¾" links	½ x 2 ½	11
			8	" " " { inside	½ x 1 5½	8
	2	1	8	" " " eye bolt	⅝ x 1 2	9
			8	" hangers } 20½" loop	⅞ x 2 2	35
			8	" " { inside shank	1 x 1 5	30
Cup	1	1	8	" " eye bolt	1 x 1 7	33
			2	Live levers, 8" & 24" centers	4 x1 x 2 6	67
			2	Dead " 7" & 21" centers	4 x1 x 2 2	58
			8	Lower connections, } jaws	2½ x ¾ x 0 9	38
			2	7' 2½" centers. { rod	¾ x 6 ½	18
					Carried forward	460

30 TON STOCK CAR.—(Continued.)

FORGINGS.—(Continued.)

C. W.	W. W.	Nuts.	Pcs.	Description	Size of Blank.	Wt.
				Brakes.—(Continued.)	Brought forward	460
Cot.			18	Connection pins	1⅛" x 0′ 4½"	22
			4	Dead lever guides, jaws	2½ x ½ x 1 6	25
			2	3′ 3¼" from center to rod	¾ x 2 4	7
	2	1	2	inside eye. eye bolt	⅞ x 2 1	8
			4	Upper c'nect'ns, brake- jaws	2½ x ¾ x 0 9	19
			1	end 12′ 9½" centers. rod	¾ x11 7½	18
			4	Upper c'nect'ns, opp'te jaws	2½ x ¾ x 0 9	19
			1	end 10′ 5¼" centers. rod	¾ x 9 3¼	14
			4	Cylinder connections, jaws	2½ x ¾ x 0 9	19
			1	7′ 8¾" centers. rod	¾ x 6 6¾	10
			2	Hand brake c'nect'ns, jaws	2½ x ¾ x 0 9	9
			1	13′ 2½" ctr. to ins. hook rod	¾ x13 ½	20
			1	Cylinder lever 20" 9" & 7" centers	3½ x1 x 2 11	34
			1	Floating lever, 6½"x14½" centers	3½ x1 x 1 10	21
			3	Lever guides	1 x 3 7	28
			1	Floating lever fulcrum	2½ x ½ x 2 4¼	10
			1	" " "	2½ x ½ x 1 0	4
		1	1	Brake shaft, Threaded ¾"	1½ x 1 3	7
			1	" " on top	1¼ x 9 9	39
			1	" " ratchet key	⅜ x ⅜ x 0 2½	1
						794
				Doors:		
			2	Top tracks	2 "x ½"x11′ 8 "	78
			4	" hangers	2 x ½ x 1 6	20
			4	Bottom hasps	2 x ½ x 1 0	13
			4	" " eye bolts	⅝ x 0 9	3
			4	Seal pins and chains	⅜ x 0 6	1
			4	" " " " staples	¼ x 0 3	1
			6	Cattle bar rests	3 x ½ x 1 6	30
						146
				Body:		
	1		8	Cross ties and sills	¾" x 1′ 10¾"	23
1		1	4	" " " "	¾ x 1 10¾	11
	1	1	16	Strap bolts and sills	⅝ x 0 8¾	11
	1	1	4	Sill steps and sills	⅝ x 0 11⅞	4
		1	12	Grab iron and end, B H	½ x 0 6¼	4
		1	30	Ladder steps and posts, B H	½ x 0 6¼	7
			8	Trussrod bearing & cross tie. lag	¾ x 0 5½	5
		1	16	Strap bolts & post, bot. side, B H	⅜ x 0 3⅜	2
		1	16	" " " " end, "	⅜ x 0 3⅜	2
		1	16	" " " girth, side, "	⅜ x 0 3⅜	2
			16	" " " " end, "	⅜ x 0 3⅜	2
					Carried forward	73

30 TON STOCK CAR—(Continued.)

RODS AND BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				Body—Continued.	Brought forward..	73
	1	1	16	Bottom slats and post, end, B. H.	3/8" x 0' 5 3/8"	3
	1	1	56	" " " " side, "	3/8 x 0 5 3/8	9
	1	1	56	Girth " " " " "	3/8 x 0 5 3/8	9
	1	1	16	" " " " end, "	3/8 x 0 5 3/8	3
1		1	4	Body truss rods, 1½" ends	1¼ x19 1	312
1		1	4	" " " 1½ "	1¼ x19 7	320
1	1	2	4	Corner post " 7/8 "	3/4 x 8 6½	51
		1	8	Diagonal brace rods 7/8 "	3/4 x 9 8	116
1	1	2	8	Int. post rods, 7/8 "	3/4 x 8 6½	102
1	1	2	4	Door " " 7/8 "	3/4 x 8 6½	51
1	1	2	4	End " " 7/8 "	3/4 x 8 11	53
			4	Running board bracket, lag	½ x 0 4 3/8	1
		1	4	" " " to cleat, C.B.	½ x 0 4 3/8	1
	2	2	6	Side pl'te tie r'ds, end pl'te and c'rlin's	5/8 x 8 10	53
		1	4	Grab irons and roof	½ x 0 5 3/4	1
	1	1	8	Strap bolt and plate	½ x 0 6 3/4	3
						1161
					Forgings	219
						1380
				Draw Gear:		
			4	Drawbar pocket rivets	1 1/8" x 0' 11½"	13
Cup	1	2	16	Draw timber and sills	7/8 x 1 11¼	62
1		2	8	" " " buffer block	7/8 x 1 7 5/8	26
	2	1	4	" " tie bolts	3/4 x 1 10 3/4	11
	1	1	24	" " and stops	3/4 x 0 8 3/4	26
		2	8	" stops and follower guides	7/8 x 0 11 3/4	16
	1	1	4	Buffer plate and buffer block	5/8 x 0 8	3
			4	" " " " " lag	5/8 x 0 5 3/4	2
			4	Uncoupling rod castings	½ x 0 4¼	2
						161
					Forgings	334
						495
				Bolsters:		
		1	8	Truss bolts, upset 1¼x3 and 6, 1¼"he'd	1¼" x 3' 9"	120
1	1	1	8	Bolster and side sill	3/4 x 1 6¼	18
1	1	1	8	" " int. "	3/4 x 1 6¼	18
		1	8	" " ctr. "	3/4 x 1 6 3/4	19
	2	1	12	" tie bolts	3/4 x 1 7	28
			12	" and side bearings, lag	5/8 x 0 5 3/4	5
			8	Rivets for truss rod straps	1 x 0 5	9
						217
					Forgings	155
						372

RODS AND BOLTS—(Continued.)

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
				Brakes:		
	1	1	16	Brake beam and plates, C. B.	½″ x 0′ 5½	5
	1	2	8	" " " head	¾ x 0 10⅛	10
2		2	4	" hanger block tie rods	⅝ x 2 8⅞	11
	2	1	2	Fl'ting lever fulcrum bl'ks & sills	⅝ x 1 4⅞	3
	1	1	4	Fl'ting lever fulcrum to cr's tie & bl'k	½ x 0 6½	1
			2	Floating lever fulcrum rivets	¾ x 0 4	1
			12	Lever guides to cross tie & sills, lags	½ x 0 4¾	3
	1	1	2	Brake shaft bracket	⅝ x 1 1⅜	2
			2	" " guides	½ x 0 4¾	1
	1		1	" " pawl, lag	¾ x 0 8	1
			2	Mid. brake shaft guides	½ x 0 4¾	1
		1	1	Roof " " "	⅝ x 0 6¼	1
	1	1	2	" " " "	⅝ x 0 6¾	1
						41
					Forgings	794
						835
				Doors:		
			36	Grate rods (no head, no thread)	⅝″ x 6′ 0 ″	216
		1	12	Joint bolts	½ x 0 9½	6
	1	1	20	Top track and plate (counter head)	½ x 0 7¾	8
	1	1	12	Hangers and door, C. B	½ x 0 3⅜	2
	1	1	8	Hasp and door	½ x 0 3⅜	2
			2	Cattle bar chain rod, lag	½ x 0 3¾	1
		1	2	Stops and girth (open), B. H	½ x 0 5⅞	1
			2	" " " " lag	½ x 0 3¾	1
			8	" post sill (closed) "	½ x 0 6¼	3
		1	4	Handle and door	½ x 0 3⅜	1
						241
					Forgings	146
						387
					Summary.	
					Body	1380
					Draw Gear	495
					Bolsters	372
					Brakes	835
					Doors	387
						3469

30 TON STOCK CAR—(Continued.)

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
2	Draw Springs, Penna. "X", 19,000 lbs. capacity		
4	Turnbuckles, open, pressed, 1½"		
2	Couplers, M. C. B. std., complete with all necessary uncoupling rod brackets, clevises and pins		
2	Chains for cattle bars.	¼" x 9 "	
4	" " door seal	No. 0 x 9 "	
1	Brake chain, ⅜" short link, 24" from inside eyebolt to inside end link, complete	⅜" x 24 "	3
19	Cotters	⅜" x 2¼"	
	F. H. Iron Wood Screws.		
8	King bolt plates	1½" No. 16,	
12	Cattle bar plates	1½ " 16,	
4	" " rests	1½ " 18,	
40	Running board brackets	2½ " 16,	
64			
	Nails, Body		
782	Floor to sills, etc.	20 d Cut	34
560	Slats to post and braces	2¼" No. 7, B.W.	8½
			42½
	Nails, Roof.		
12	Purlines and ridge pole to plates	4 " No. 6, B.W.	½
90	" " " " to carlines	3¼ " 9, "	1½
189	Running boards	2 " 11, "	1¼
1548	Lower roofing	2 " 11, "	10¼
1548	Upper "	3¼ " 9, "	24¾
76	Running board saddles	3¼ " 9, "	1¼
90	Fascia	40 d Cut	6½
			45¾
		Total	88¼

U. S. STANDARD SQUARE NUTS.

	1½"	1"	⅞"	¾"	⅝"	½"	⅜"		
Body	8	....	48	20	64	44	208		56¾
Draw Gear	....	....	64	28	4	....	....		31½
Bolster	8	....	....	36	....	....	....		22¼
Brake	....	16	2	17	30	22	....		16½
Door	....	....	....	....	....	58	....		4¾
Total	16	16	114	101	98	124	208		141¾

WROUGHT WASHERS.

Body	....	....	20	12	64	8	144		11
Draw Gear	....	....	16	32	4	....	....		5½
Bolster	....	....	....	40	....	....	....		4
Brake	....	8	4	10	32	20	....		5¾
Door	....	....	....	....	....	40	....		1½
Total	....	8	40	94	100	68	144		27¾

Paint Materials.

30-TON STOCK CAR.—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
1147	feet.	Lumber, pine, sills, etc....		
783	"	" flooring.....		
287	"	" slats, 1".....		
220	"	" " 2".....		
860	"	" roofing.....		
64	"	" fascia.....		
80	"	" running b'ds.		
1422	"	oak.....		
4863	"			
		Kiln drying.....		
1521	lbs.	Castings, gray iron.....		
3469	"	Wrought iron.....		
141¾	"	Square nuts.....		
27¾	"	Wrought washers.....		
40½	"	Nails, cut.....		
47¾	"	" B. W.....		
64		Screws.....		
2		Draw springs.....		
3	"	Chain, brake.....		
1¼	"	" ¼".....		
3	feet.	" bright.....		
19		Cotters.....		
2		Couplers.....		
4		Turnbuckles, 1½".....		
		Paint materials.....		
		Labor:		
		Lumber yard.....		
		Mill.....		
		Blacksmith.....		
		Bolt room.....		
		Iron machine.....		
		Car builders.....		
		Painters.....		
		General labor.....		
		General expense.....		
		RECAPITULATION.		
		Materials.....		
		Labor.....		
		General expense.....		

DRAW GEARS.

CHAPTER IV.

DRAW GEARS.

GENERAL.

There is probably no portion of the freight car that is subjected to such modifications of application as the draw gear, as the master car builders differ very widely in their idea of addition or omission of tie straps and other details in connection with the application of the various patented draw gears.

This is also applicable to the patentees of the various draw gears, who frequently present drawings of their attachment in connection with the Pennsylvania Railroad or some other railroad company's standard. This is very often misleading, and the estimator should state the particular drawing upon which his estimate is based for the application of the draw gear under consideration.

IT SHOULD THEREFORE BE NOTED THAT THE COMPARISONS HEREIN PRESENTED ARE ALL BASED UPON THE APPLICATION OF THE VARIOUS ATTACHMENTS TO THE M. C. B. RECOMMENDED PRACTICE, OF ATTACHING AUTOMATIC COUPLERS PLATE B. 1896, INCLUDING DEAD IRONS, TO CARS WITH 8-INCH SILLS AND THE ORDINARY WOODEN BODY BOLSTER 16 INCHES WIDE AND LOCATED 5' 0" FROM CENTER TO OUTSIDE FACE OF END SILL, REGARDLESS OF WHAT MAY BE SHOWN IN SOME OF THE ILLUSTRATIONS.

The application of iron or steel body bolsters would materially affect the length of the draft timbers, and necessitate the addition of four or more bolts, but the differences in the draw gears would remain the same, as these changes would be common to all.

If dead irons are not required, deductions from the various bills should be made as follows: 3 ft. Oak, 300 lbs. castings, and 10 lbs. wrought iron; (the latter caused by the shortening of the bolts securing dead iron to buffer block and end sill

from 25" to 17".) This would also add four wrought washers for ⅞" bolt, ½ lb.

It should be particularly noted that in ordering draw bars or couplers for either the American Continuous or Hoey Draft Attachment it must be so stated, as these attachments require bars especially adapted for them.

Special features and deviations from common practice as enumerated below.

M. C. B. RECOMMENDED PRACTICE, PLATE B. 1896.

In 1893 a Recommended Practice was adopted for attaching M. C. B. automatic couplers to cars, as shown on Sheet B, and by a separate vote the use of a draft spring, 6¼ inches diameter, 8 inches long, with 2⅛ inches motion, was recommended. At that time the capacity of the spring was placed at 22,000 pounds, but this was changed in 1896 to 19,000 pounds to better accord with the facts. See Proceedings 1893 and 1896.

This draw gear having been recommended practice for three consecutive years and adopted by many railroads as standard, and since it will undoubtedly be adopted as a standard by the M. C. B. Association at the next convention, it was deemed the most practicable basis of comparison.

Miner Attachment.—The principal feature of this attachment is the use of two springs, 6¼ x 8" in tandem at each end, acting simultaneously, requiring eight follower plates.

The bill of material herewith presented includes wrought iron follower plates and bottom follower guides; these are furnished with the attachment in malleable iron if so desired, but should be considered an extra above price quoted for regular equipment.

Bryan Attachment.—This attachment embodies the principles of the Miner, excepting that the springs are 6" x 7" and that a hollow front spring follower and combination spring pocket are used as shown by the illustration.

In connection with this draw gear it should be particularly noted that Mr. Bryan also has a patent for a single spring attachment, which differs from that of the double spring in so far as they specify one spring 6¼"x8" instead of two springs 6"x7". Thus allowing the omission of four malle-

able iron followers, modification of the stop castings, and omission of the outside draw bar pocket.

Butler Attachment.—The application of this attachment is very clearly illustrated in every detail by the cut accompanying the bill of material, which is an exact reproduction of the Butler Attachment Company's working drawing.

Gould Attachment.—The special features of this draw gear are as follows:

1st. Two springs 6"x7" arranged parallel at each end, 18,000 lbs. capacity each, are recommended instead of one 6¼"x8", 19,000 lbs. capacity.

2nd. 4½ x 1 x 3' 6" draw bar pockets instead of 4x1x3' 8".

3rd. 6 x 1½ x 11¾" followers instead of 6 x 1½ x 8¾".

4th. 3 x 1 carry irons on account of the notches in Gould draft arm, instead of 4 x 1.

5th. Two 3 x ¾ draw timber tie straps, instead of four 2¼ x ⅜.

6th. A set of continuous rods at each side of draw timbers are specified with gear, tying draft arm to cross ties, and cross ties together.

7th. This necessitates the application of compression timbers under center sills on all cars which are not already provided for same.

The accompanying bill of material includes four combination cap and distance pieces, which are furnished by the Gould Coupler Co., but not included in their regular quotation for the four draft arms.

These may be omitted if desired and wrought iron caps and wood distance pieces substituted.

Attention is called in this particular case to illustration which shows double iron bolster and ⅞" bolts with draft timber keys and cup washers for compression timbers.

The bill of material is based on the use of wood bolster, M. C. B. draw gear and ⅝" bolts without cup washer and draw timber keys, this latter not being adhered to in common practice.

Schoen Attachment.—This attachment is manufactured of pressed steel and applied as per illustration accompanying bill of material, excepting that pressed steel followers are shown, which are an extra and not part of their regular equipment,

but may be used instead of wrought iron with their, or any similar draw gear.

American Continuous Attachment.—The two couplers are connected by means of a cross head and two draft rods. One stationary follower plate at each end is used instead of the usual two.

It should be noted that both cast iron and wood stop blocks are shown on the illustration and included in the bill of material. Some railroad companies, however, use only one or the other.

It might be mentioned that this draw gear is applied on the royalty basis, the car manufacturer furnishing all materials.

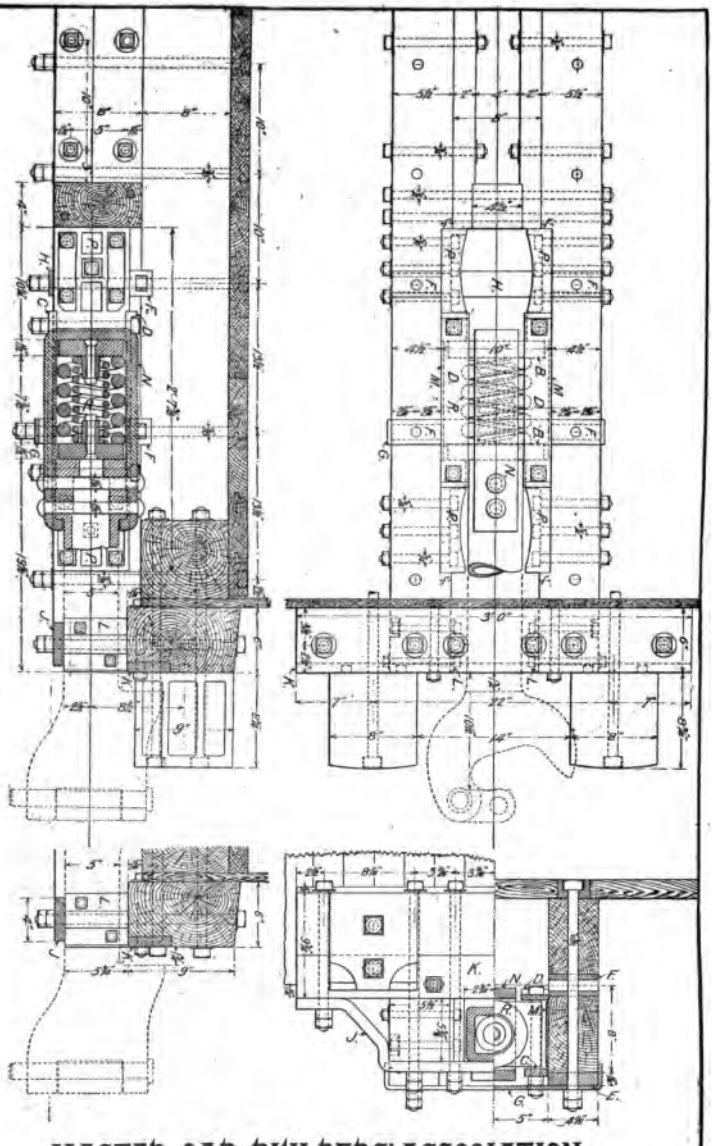
Canda Attachment.—The details shown by cut, together with bill of material, will fully explain the application.

Graham Attachment.—This attachment is standard on several large railroads, but its application differs widely in the detail.

The accompanying illustration, however, shows the basis of the bill of material.

Hoey Attachment.—The principal features of this attachment are the application of a 3″ x 1″ safety bar extending crosswise through rear end of coupler and both draft timbers, also two diagonal tie straps at each end, all as shown by cut.

Monarch Attachment.—A combination draw timber tie and follower support is applied instead of the usual two wrought iron supports, and the two malleable iron stop castings extend to front end of draw timbers, thus allowing the omission of the draw timber guards.



MASTER CAR BUILDERS' ASSOCIATION.

RECOMMENDED PRACTICE FOR ATTACHING AUTOMATIC COUPLERS TO CARS.

REVISED 1896.

M.C.B. B SEP. 1893.

BILL OF ALL MATERIALS NECESSARY FOR THE APPLICATION OF THE 1896 M. C. B. RECOMMENDED DRAW GEAR.

Plate B.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Draw timbers	Oak	5½" x 8 " x4′ 10½"	5¾" x 8¼" x5′ 3"	83′
4	Rear stop timbers	"	2 x 8 x	2¼ x 8¼ x2 0	12
2	Distance blocks	"	4 x 8 x0 4½	4¼ x 8¼ x0 6	3
2	Buffer blocks	"	6 x10¼ x3 0	6¼ x10½ x3 3	36
					134′

CASTINGS.

Pcs.	Patterns.	Description.	Mat'l.	Wt.
4	.....	Dead blocks	Gray Iron	300
8	.....	Draw bar stops	" "	240
8	.....	" timber keys	" "	32
20	.....	⅞" socket washers	" "	35
4	.....	Follower thimbles	" "	4
4	.....	Distance castings	" "	12
				623

FORGINGS.

C. W. W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
		2	Draw bar carry irons	4 "x1 "x3′ 6 "	93
		2	" " striking plates	4 x ⅞ x3 0	70
		4	" " timber guards	5¾ x ⅝ x0 6	14
		4	Follower chafing plates	6 x ¼ x0 10⅝	18
		2	Draw bar pockets	4 x1 x3 8	98
		4	Follower plates	6 x1½ x0 8¾	88
		4	Bottom follower guides	2 x ¾ x1 4½	27
		4	Top " "	2½ x ½ x1 5⅛	24
		4	Draw timber tie straps	2¼ x ⅝ x1 11¾	22
					454

M. C. B. DRAW GEAR.

BOLTS.

C. W.	W. W	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	8	Dead, buffer blocks and end sills.	$\frac{7}{8}$" x 2′ 1"	33
	1	1	4	Striking plate and buffer block.	$\frac{3}{4}$ x 0 9	5
	1	2	4	Carry irons and " "	$\frac{7}{8}$ x 1 3	10
	1	2	4	" " draw timb. and buffer block.	$\frac{7}{8}$ x 1 $8\frac{7}{8}$	14
	1	2	4	" " and buffer block.	$\frac{7}{8}$ x 1 $8\frac{7}{8}$	14
1	1	2	4	Draw timber and end sills.	$\frac{7}{8}$ x 1 $9\frac{3}{8}$	14
1		2	4	Tie strap, distance block, draft timber and center sill.	$\frac{7}{8}$ x 1 11	15
1		2	4	Tie strap, draw timber and center sill.	$\frac{7}{8}$ x 1 $9\frac{3}{4}$	15
1	1	2	8	Draw timber and center sill.	$\frac{7}{8}$ x 1 $9\frac{3}{8}$	28
		2	8	Follower guides and stops	$\frac{7}{8}$ x 1 $\frac{5}{8}$	16
			4	Draw bar pocket rivets.	$1\frac{1}{8}$ x $11\frac{7}{2}$	12
			4	Follower thimble rivets	$\frac{3}{4}$ x 0 5	3
	1	1	4	Draw timb. guard and draw timber.	$\frac{5}{8}$ x 0 $7\frac{1}{2}$	3
	1	1	4	" " " " " "	$\frac{5}{8}$ x 0 $8\frac{1}{2}$	3
	1	1	40	Draw bar stops and draw timbers.	$\frac{3}{4}$ x 0 $8\frac{3}{8}$	42
	2	1	4	Draw timber tie bolts	$\frac{3}{4}$ x 1 10	11
	2	1	16	Draw timber and rear stop blocks.	$\frac{3}{4}$ x $10\frac{1}{2}$	21
						260
					Forgings	454
						714

MISCELLANEOUS MATERIALS.

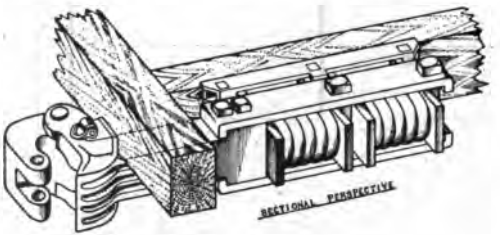
Per Car.	Description.	Size.	Wt.
2	Draw springs, double coil, capacity 19,000 lbs., $2\frac{1}{8}$" free motion	$6\frac{1}{4}$"x8"	
32	Wood screws, follower chafing plate	2" No. 14.	
8	U. S. Std. Square Nuts.	For $\frac{5}{8}$" bolt.	1
64	" " " "	" $\frac{3}{4}$ "	16
88	" " " "	" $\frac{7}{8}$ "	33
			50
8	Wrought washers.	For $\frac{5}{8}$ bolt.	1
84	" "	" $\frac{3}{4}$ "	8
32	" "	" $\frac{7}{8}$ "	4
			13

M. C. B. DRAW GEAR—(Continued).

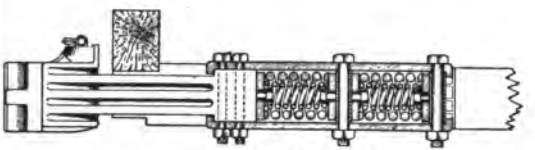
SUMMARY.

Quantity.		Specifications.	Price	Am'nt.
134	Feet.	Lumber, white oak.....		
623	lbs.	Castings, gray iron.....		
714	"	Wrought iron.....		
50	"	Square nuts.....		
13	"	Wrought washers.		
32		Screws, wood		
2		Springs		
		Labor:		
		Lumber yard.....		
		Mill.....		
		Blacksmith.		
		Bolt room.....		
		Iron machine.		
		Car builders.....		
		General labor		
		" expense.....		
		RECAPITULATION.		
		Materials.....		
		Labor.....		
		General expense.....		

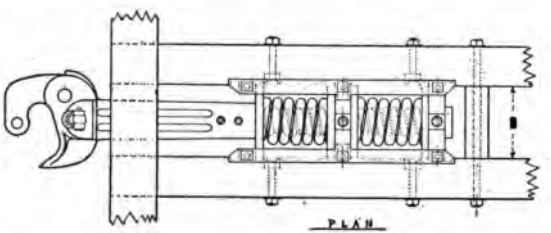
MINER IMPROVED DRAFT RIGGING.



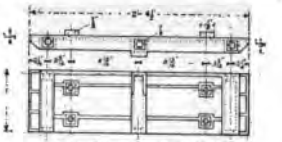
SECTIONAL PERSPECTIVE



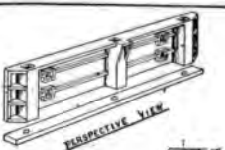
VERTICAL SECTION



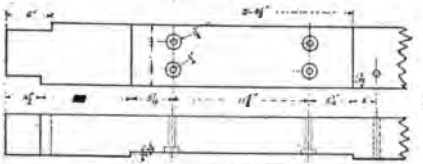
PLAN



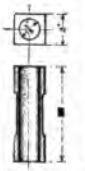
DRAW BAR STOP - MALLEABLE
4 per car



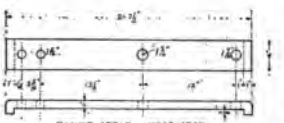
PERSPECTIVE VIEW



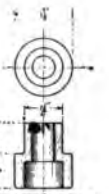
DRAW TIMBER



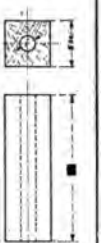
VERTICAL THIMBLE
Nall' 4 per car



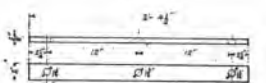
POCKET STRAP - WROT IRON
4 per car



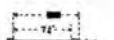
FOLLOWER THIMBLE
Nall'd per car



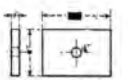
SPACING THIMBLE
2 per car



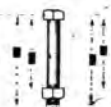
SPRING PLATE - WROT IRON
4 per car



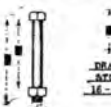
SPRING PLATE BOLT
12 per car



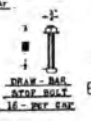
FOLLOWER PLATE
6 per car



POCKET BOLT
4 per car



POCKET BOLT
4 per car



DRAW-BAR STOP BOLT
16 - per car

TIE BOLT
2 per car

BILL OF ALL MATERIALS NECESSARY FOR THE APPLICATION OF THE MINER ATTACHMENT TO THE 1896 M. C. B. RECOMMENDED DRAW GEAR.

Plate B.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
4	Draw timbers...	Oak	5½"x 8¼"x4' 10½"	5¾"x 8¼"x5' 3"	83
2	Buffer blocks....	"	6 x10¼ x3 0	6¼ x10½ x3 3	36
2	Distance blocks..	"	4 x 8 x0 9¼	4¼ x 8¼ x1 0	6
					125'

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Wt.
4	.....	Dead blocks	Gray Iron.	300
8	.....	Draw timber keys	" "	32
20	.....	⅞" socket washers.....	" "	35
8	.....	Distance castings	" "	32
				399

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Draw bar carry irons.....	4" x1" x3' 6 "...	93
			2	" " striking plates.....	4 x ⅞ x3 0 ...	70
			4	" timber guards.....	5¾ x ⅜ x0 6 ...	14
			4	" bar tail straps.....	4 x1 x2 9½ ...	149
			8	Follower plates.....	6 x1 x0 9 ...	120
			4	Bottom follower guides	2 x ⅝ x2 4½ ...	40
			4	Draw timber tie straps	2¼ x ⅜ x1 11¾ ...	22
						508

MINER ATTACHMENT—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	8	Dead, buffer block and end sill	$\frac{7}{8}$"x2' 1"	33
	1	1	4	Striking plate and buffer block	$\frac{3}{8}$ x0 9	5
	1	2	4	Carry iron and buffer block	$\frac{1}{2}$ x1 3	10
	1	2	4	" " draw timber buffer block	$\frac{7}{8}$ x1 $8\frac{7}{8}$	14
	1	2	4	" " and buffer block	$\frac{7}{8}$ x1 $8\frac{7}{8}$	14
1	1	2	4	Draw timber and end sill	$\frac{7}{8}$ x1 $9\frac{3}{8}$	14
1		2	8	Tie strap, distance block, draw timber and center sill	$\frac{7}{8}$ x1 11	31
1	1	2	8	Draw timber and center sill	$\frac{7}{8}$ x1 $9\frac{3}{8}$	28
		2	12	Follower guides and stops	$\frac{3}{8}$ x0 $11\frac{3}{4}$	18
Cot.		1	4	Pocket straps to draw bar	$1\frac{1}{2}$ x1 1	14
	1	1	4	Draw timber guards to timber	$\frac{5}{8}$ x0 $7\frac{1}{2}$	3
	1	1	4	" " " "	$\frac{5}{8}$ x0 $8\frac{1}{2}$	3
	1	1	16	Drawbar stops to timbers	$\frac{5}{8}$ x0 $7\frac{3}{8}$	15
	2	1	4	Draw timber tie bolts	$\frac{3}{4}$ x1 10	11
Cot.		1	4	Tail strap tie bolts	$1\frac{3}{8}$ x1 $1\frac{3}{4}$	22
						235
					Forgings	508
						743

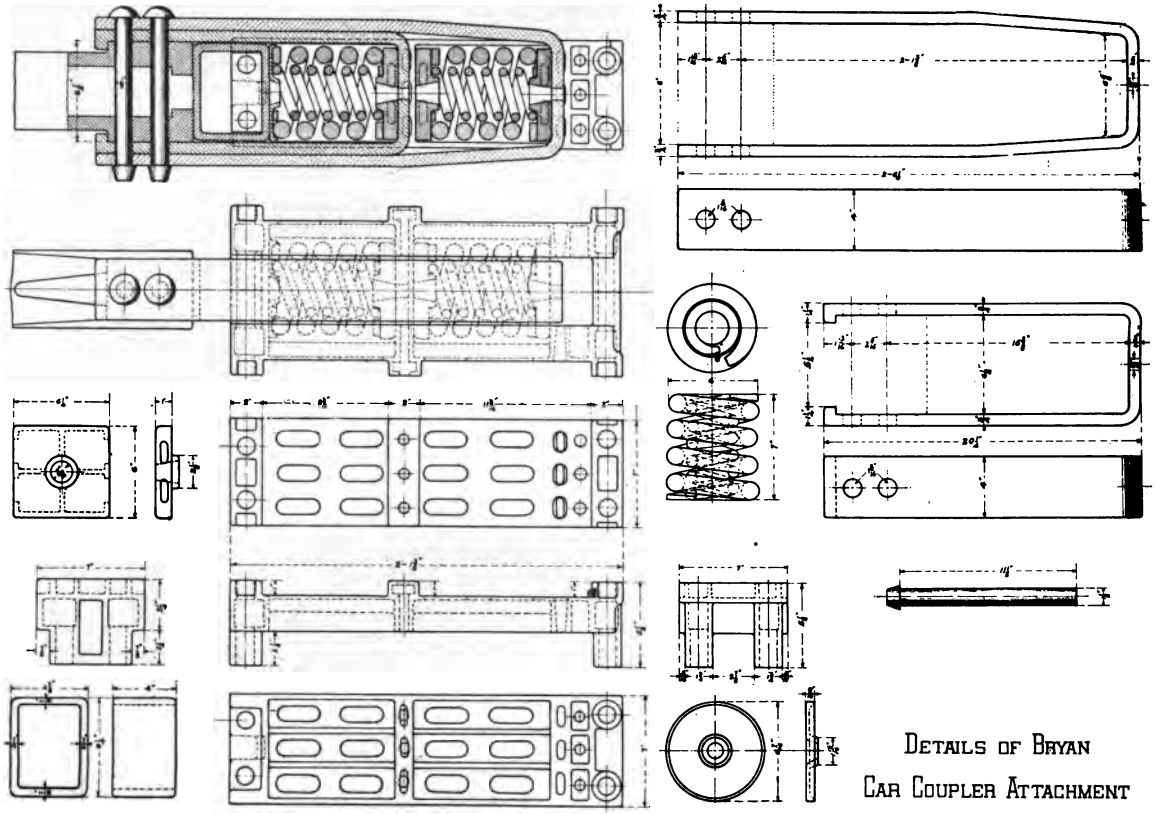
MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
1 Set	Miner attachment complete for one car, including		
4	Stop castings		
4	Verticle thimbles		
8	Follower thimbles		
	W. H. Miner, patentee, Rookery Bldg., Chicago, Ill.		
4	Draw springs, double coil, 19,000 lbs. capacity, $2\frac{1}{8}$" free motion	$6\frac{1}{4}$"x8"	
8	Spring cotters	$\frac{3}{8}$ x$2\frac{1}{4}$	
8	U. S. Standard square nuts	For $\frac{5}{8}$" bolt	1
48	" " " "	" $\frac{3}{4}$ "	12
72	" " " "	" $\frac{7}{8}$ "	27
4	" " " "	" 1"	3
4	" " " "	" $1\frac{1}{8}$ "	6
			49
8	Wrought washers	For $\frac{5}{8}$ bolt	1
28	" "	" $\frac{3}{4}$ "	3
32	" "	" $\frac{7}{8}$ "	4
			8

MINER ATTACHMENT—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price	Am'nt.
125	feet.	Lumber, white oak.....		
399	lbs.	Castings, gray iron.....		
743	"	Wrought iron.....		
		Miner attachment { malleables .		
		" " { royalty		
4		Draw springs.....		
8		Spring cotters.....		
49	lbs.	Square nuts.....		
8	"	Wrought washers.....		
		Labor.		
		Lumber yard.....		
		Mill.....		
		Blacksmith.....		
		Bolt room.....		
		Iron machine.....		
		Car builders.....		
		General labor.....		
		" expense.....		
		RECAPITULATION.		
		Materials.....		
		Labor.....		
		General expense.....		



Details of Bryan Car Coupler Attachment

PATD MAY 21, 1895

BILL OF ALL MATERIALS NECESSARY FOR THE APPLICATION OF THE BRYAN ATTACHMENT TO THE 1896 M. C. B. RECOMMENDED DRAW GEAR.

Plate B.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Draw timbers.	Oak	5½" x 8 " x4' 10½"	5¾" x 8¼" x5' 3"	83'
2	Buffer blocks	"	6 x 10¼ x3 0	6¼ x 10½ x3 3	36
					119'

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Wt.
4		Dead blocks.	Gray Iron ..	300
8		Drawbar timber keys.	" " ..	32
20		⅞" socket washers.	" " ..	35
8		Distance castings.	" " ..	32
				399

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Drawbar carry irons	4 " x1 " x3 ' 6 "	93
			2	" striking plates.	4 x ⅞ x3 0	70
			4	Draw timber guards.	5¾ x ⅝ x0 6	14
			2	Drawbar outside pockets.	4 x ¾ x5 6⅝	111
			2	" inside "	4 x ¾ x4 0	80
			4	Draw timber washers	2 x ½ x0 7¾	9
			4	" " "	2 x ½ x0 7¾	9
			4	" " tie straps	2¼ x ⅝ x1 11¾	22
						408

BRYAN ATTACHMENT—(Continued.)

BOLTS

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	8	Dead, buffer block and end sill	$\frac{7}{8}$" x 2' 1 "	33
	1	1	4	Striking plate and buffer block.	$\frac{5}{8}$ x 0 9	5
	1	2	4	Carry iron and buffer block	$\frac{3}{4}$ x 1 3	10
	1	2	4	" " draw timber and buffer block...	$\frac{7}{8}$ x 1 $8\frac{7}{16}$	14
	1	2	4	" " and buffer blocks.....	$\frac{7}{8}$ x 1 $8\frac{7}{16}$	14
1	1	2	4	Draw timber and end sill.....	$\frac{7}{8}$ x 1 $9\frac{3}{16}$	14
1		2	8	Tie strap, distance block, draw timber and center sill	$\frac{7}{8}$ x 1 11	31
1	1	2	8	Draw timber and center sill.....	$\frac{7}{8}$ x 1 $9\frac{3}{8}$	28
	1	1	12	Stop castings to draw timber T. H.....	$\frac{5}{8}$ x 0 $7\frac{1}{4}$	7
	1	1	12	" " " " "	$\frac{5}{8}$ x 0 $8\frac{1}{2}$	9
			4	Pocket to drawbar, rivet	$1\frac{1}{4}$ x 1 1	14
	1	1	4	Draw timber guards and timbers.	$\frac{5}{8}$ x 0 $7\frac{1}{2}$	3
	1	1	4	" " " " "	$\frac{5}{8}$ x 0 $8\frac{1}{2}$	3
	P	2	8	Draw bar stops to timbers.	1 x 2 $1\frac{5}{16}$	45
						230
					Forgings.....	408
						638

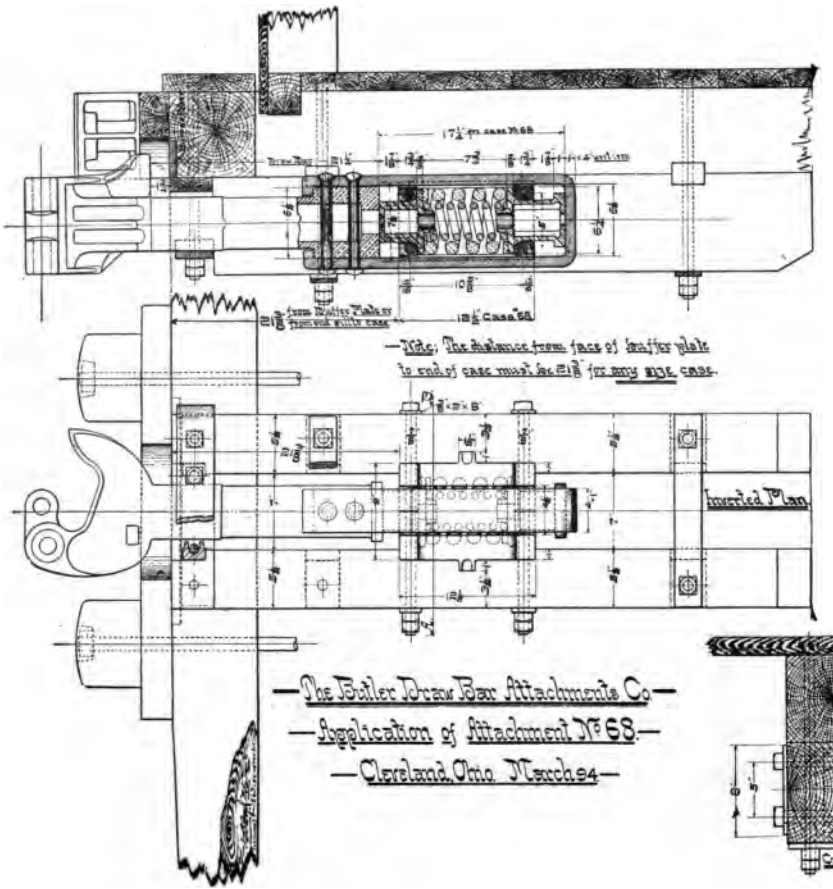
MISCELLANEOUS MATERIALS.

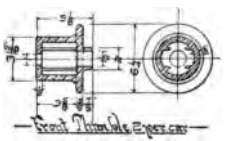
Per Car.	Description.	Size.	Wt.
	The Bryan Attachment complete for one car, including,		
	4 Stop castings,		
	6 Followers,		
	2 "		
	2 Spring seats,		
	All as supplied by the Springfield Malleable Iron Co., under patents of H. S. Bryan of Two-Harbors, Minn. Quotation to include royalty.		
4	Draw springs, double coil, $1\frac{1}{8}$" and $\frac{5}{8}$" steel, 18,000 lbs. capacity.	6 " x 7"	
32	U. S. Std Square Nuts.....	For $\frac{5}{8}$" bolt.	5
4	" " " "	" $\frac{3}{4}$ "	1
72	" " " "	" $\frac{7}{8}$ "	27
16	" " " "	" 1 "	8
			41
32	Wrought Washers.....	For $\frac{5}{8}$" bolt.	2
4	" "	" $\frac{3}{4}$ "	1
32	" "	" $\frac{7}{8}$ "	4
			7

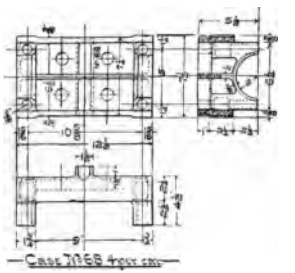
BRYAN ATTACHMENT—(Continued.)

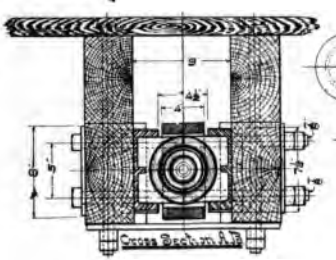
SUMMARY.

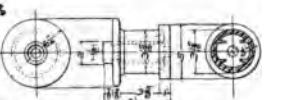
Quantity.		Description.	Price.	Amount.	
119	feet.	Lumber, oak.			
399	lbs.	Castings, gray iron.			
638	"	Wrought iron			
		Bryan attachments, malleables			
		Bryan attachm'ts, royalty			
4		Draw springs.			
41	lbs.	Square nuts.			
7	"	Wrought washers			
		Labor:			
		Lumber yard.			
		Mill.			
		Blacksmith			
		Bolt room.			
		Iron machine.			
		Car builders.			
		General labor.			
		" expense.			
		RECAPITULATION.			
		Material.			
		Labor			
		General expense.			











—The Buffer Draw Bar Attachment Co.—

—Application of Attachment No 68.—

—Cleveland, Ohio. March 94—

BILL OF ALL MATERIALS NECESSARY FOR THE APPLICATION OF THE BUTLER ATTACHMENT TO THE 1896 M. C. B. RECOMMENDED DRAW GEAR.

Plate B.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Draw timbers..	Oak	5½" x 8 " x4' 10½"	5¾" x 8¼" x5 ' 3 "	83'
2	Buffer blocks .	"	6 x10¼ x3 0	6¼ x10½ x3 3	36
					119'

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Wt.
4	.....	Dead blocks.	Gray Iron..	300
8	.....	Draw timber keys.....	" "	32
20	.....	⅞" socket washers	" "	35
4	.....	Distance castings	" "	12
				379

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Draw bar carry iron. ....t.....	1 "x1 "x3 ' 6 "	93
			2	" " striking plates.....	4 x ⅞ x3 0	70
			4	" timber guards.	5¾ x ⅞x½ x0 6	14
			2	" bar pockets	4 x1 x4 8¾	126
			4	" timber tie straps.	2¼ x ⅜x1 11¼	22
			8	" attachment bolt washers	2 x ⅜x0 8	13
						338

BUTLER ATTACHMENT—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	8	Dead and buffer block to end sill.....	$\frac{7}{8}$″x2′ 1 ″....	33
	1	1	4	Striking plate and buffer block	$\frac{7}{8}$ x0 9	5
	1	2	4	Carry iron " " "	$\frac{7}{8}$ x1 3	10
	1	2	4	" " draw timber and buffer block ...	$\frac{7}{8}$ x1 $8\frac{7}{8}$	14
	1	2	4	" " and buffer block	$\frac{7}{8}$ x1 $8\frac{7}{8}$	14
1	1	2	4	Draw timbers and end sill.....	$\frac{7}{8}$ x1 $9\frac{1}{8}$	14
1		2	4	Tie straps, distance block, draw timber and center sill	$\frac{7}{8}$ x1 11	15
1		2	4	Tie straps, distance blocks, draw timbers and center sills	$\frac{7}{8}$ x1 $9\frac{3}{4}$	15
1	1	2	8	Draw timber and center sills	$\frac{7}{8}$ x1 $9\frac{3}{8}$	28
			4	Draw bar pocket rivets	$1\frac{1}{8}$ x $11\frac{1}{2}$	13
	1	1	4	Draw timber guard and draw timber.....	$\frac{5}{8}$ x0 $7\frac{1}{2}$	3
	1	1	4	" " " " " "	$\frac{5}{8}$ x0 $8\frac{1}{2}$	3
		2	8	Drawbar attachment bolts.....	$\frac{7}{8}$ x1 $10\frac{5}{8}$	30
						197
					Forgings	338
						535

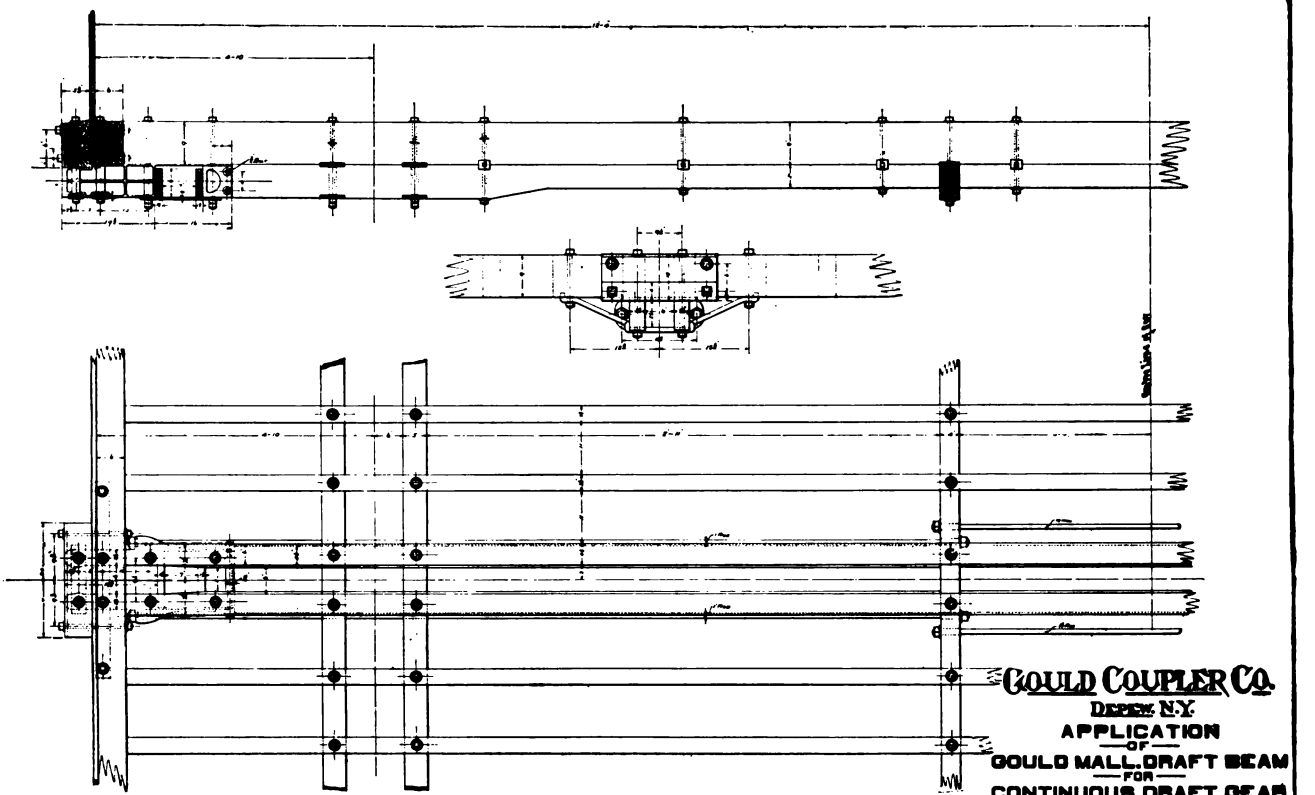
MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
1 Set.	Butler attachment No. 68, complete for one car. For $6\frac{1}{4}$″x8″ draw springs	.....	....
	As supplied by The Butler Drawbar Attachment Co., Cleveland, O.....		
2	Draw Springs, double coil, capacity 19000 lbs., $2\frac{1}{8}$″ free motion	.....	....
8	U. S. Standard square nuts.....	For $\frac{5}{8}$″ bolts.	1
4	" " " "	" $\frac{3}{4}$ "	1
88	" " " "	" $\frac{7}{8}$ "	33
			35
8	Wrought iron washers.....	For $\frac{5}{8}$″ bolt.	1
4	" " "	" $\frac{3}{4}$ "	1
32	" " "	" $\frac{7}{8}$ "	4
			6

BUTLER ATTACHMENT—(Continued).

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
119	feet.	Lumber, white oak.		
379	lbs.	Castings, gray iron.		
535	"	Wrought iron		
35	"	Square nuts.....		
6	"	Wrought washers		
2		Springs.....		
1	set.	Butler attachment.....		
		Labor:		
		Lumber yard.		
		Mill.		
		Blacksmith		
		Bolt room.		
		Iron machine.		
		Car builders.....		
		General labor		
		" expense.		
		RECAPITULATION.		
		Material.		
		Labor.		
		General expense.....		



GOULD COUPLER CO.

DEPEW N.Y.

APPLICATION

OF

GOULD MALL. DRAFT BEAM

FOR

CONTINUOUS DRAFT GEAR

GOULD ATTACHMENT.

Complete Bill of all Materials Necessary for the Application of the GOULD ATTACHMENT to the 1896 M. C. B. Recommended Draw Gear.

Plate B.

LUMBER

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Draw timbers.....	Oak.	5½"x 8 "x2' 5"	5¾"x 8¼"x2' 9"	44
2	Buffer blocks.....	"	6 x10½ x3 0	6¼ x10⅝ x3 3	36
2	Compression timbers.	"	4½ x 5 x7 8	4¾ x 5¼ x8 0	33
4	" "	"	4½ x 5 x7 2	4¾ x 5¼ x7 6	63
					176

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Weight.
4	.....	Dead blocks.....	Gray Iron.	300
8	.....	Draw timber keys.....	" "	32
20	.....	Cup washers, ⅞" bolt.....	" "	35
8	.....	Follower thimbles.....	" "	8
				375

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Weight.
			2	Drawbar carry irons.....	3 "x1 "x 3 ' 6"	70
			2	" striking plates	4 x ⅞ x 3 0	70
			2	" pockets.....	4½ x1 x 3 6	105
			4	Follower plates	6 x1½ x 11¾	118
			4	" carriers.....	3½ x ½ x 1 6	35
			2	Draw timber tie straps under end sill	3 x ¾ x 1 6	22
						420

GOULD ATTACHMENT—(Continued.)

BOLTS AND RODS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	8	Dead block, buffer block and end sill	7/8" x 2' 1"	33
	1	1	4	Striking plate and buffer block	3/8 x 0 9	5
	1	2	4	Carry iron to buffer block at end	3/8 x 1 3	10
	1	2	4	Gould attachment to buffer block at carry iron	1/2 x 1 8 1/2	14
1		2	4	Gould attachment to end sill and draw timber tie	7/8 x 1 7 7/8	13
1		2	8	Gould attachment to center sill and follower carriers	7/8 x 1 8 3/8	27
	1	2Hx	4	Gould attachment to crosstie, upset 1 1/4"	1 x12 10 1/4	135
		1	4	Gould attachment and draw timber tie bolts	7/8 x 1 5 3/8	12
1	1	2	8	Draw timber and center sill	7/8 x 1 9 3/8	29
			4	Drawbar pocket rivets	1 1/8 x 0 11 1/2	13
			8	Follower thimble rivets	3/4 x 0 5	5
	2	2Hx	2	Crosstie, tie rods	1 1/8 x 8 9	58
	2	1	18	Compression timbers to center sills	3/8 x 1 3 1/2	23
						377
					Forgings	420
						797

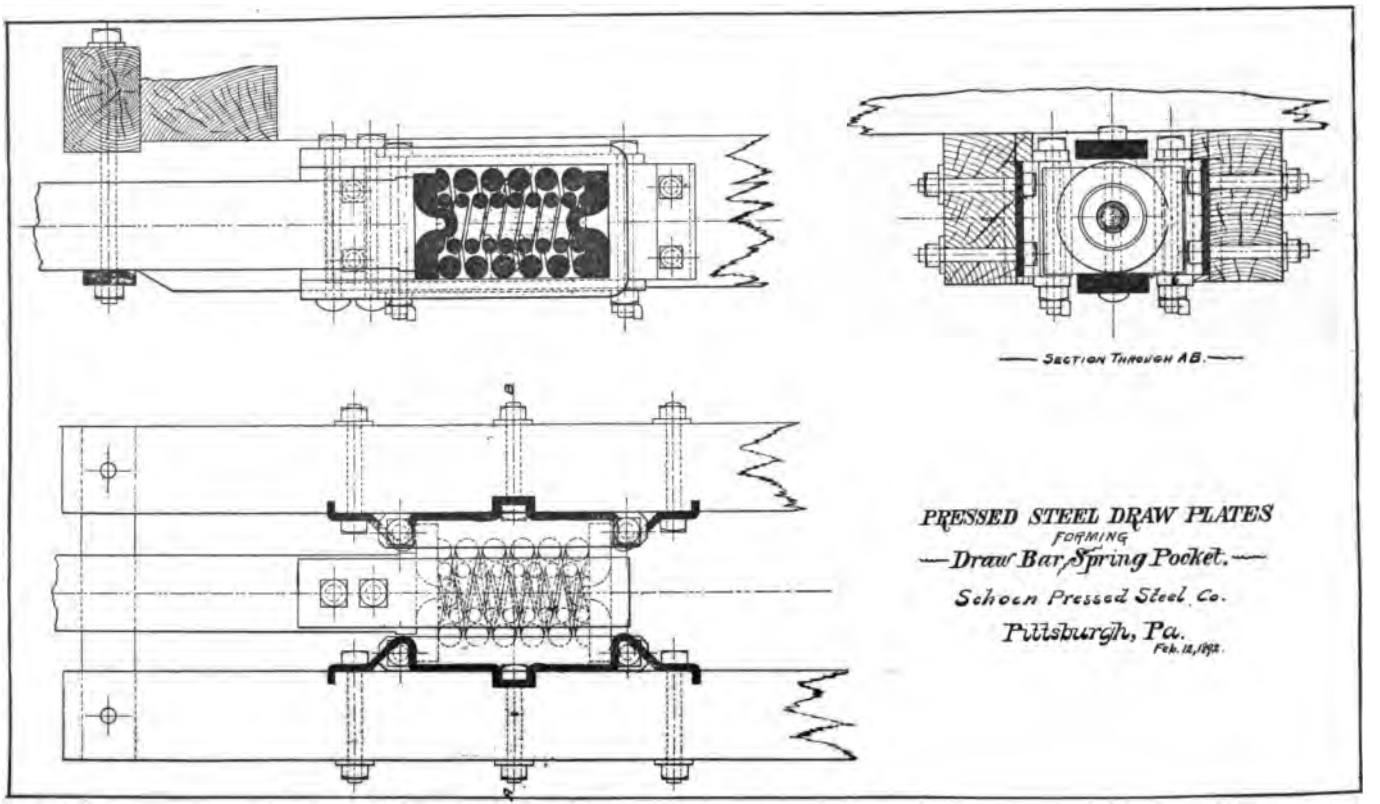
MISCELLANEOUS MATERIALS.

Per Car	Description.	Size.	Wt.
	Gould Attachment complete, consisting of 4 malleable draft arms and 4 malleable distance pieces, including royalty. All as supplied by the Gould Coupler Co., of Depew, N. Y.		
4	Draft springs, double coil, 18,000 capacity	6"x7"	
18	U. S. Standard square nuts	For 5/8" bolt	3
4	" " " "	" 1/2 "	1
68	" " " "	" 1/4 "	25
			29
12	U. S. Standard hexagon nuts	For 1 1/8 bolt	8
36	Wrought washers	For 5/8 bolt	3
4	" "	" 1/2 "	1
24	" "	" 1/4 "	3
8	" "	" 1 1/8 "	2
			9

GOULD ATTACHMENT—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
176	feet.	Lumber, oak.			
375	lbs.	Castings, gray iron.			
797	"	Wrought iron			
1	set.	Gould attachm't complete Including royalty.....			
4		Springs.....			
29	lbs.	Square nuts.....			
8	"	Hexagon nuts.....			
9	"	Wrought washers			
		Labor:			
		Lumber yard.....			
		Mill.....			
		Blacksmith			
		Iron machine.....			
		Bolt room.....			
		Car builders.....			
		General labor			
		" expense.....			
		RECAPITULATION.			
		Material.			
		Labor.			
		Royalty.			
		General expense.....			


SECTION THROUGH AB.
PRESSED STEEL DRAW PLATES
FORMING
Draw Bar Spring Pocket.
Schoen Pressed Steel Co.
Pittsburgh, Pa.
Feb. 12, 1912.

BILL OF ALL MATERIALS NECESSARY FOR THE APPLICATION OF THE SCHOEN ATTACHMENT TO THE 1896 M. C. B. RECOMMENDED DRAW GEAR,

(Plate B.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Draw timbers.....	Oak..	5½″x 8″ x 4′ 10½″	5¾″x 8¼″ x 5′ 3″	83′
2	Distance Blocks.....	"	4 x 8 x	4¼ x 8¼ x 1 0	6
2	Buffer "	"	6 x10¼ x 3 0	6¼ x10½ x 3 3	36
4	Nut locks for attachm'ts..	Pine..	.....	1 x 3 x 2 0	2
					127′

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Wt.
4	.....	Dead Blocks.....	Gray Iron.	300
8	.....	Draw timber keys.....	" "	32
20	.....	⅞″ socket washers.....	" "	35
4	.....	Follower thimbles.....	" "	4
4	.....	Distance castings	" "	12
				383

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Draw bar carry irons.....	4″ x 1 ″ x 3′ 6″....	93
			2	" " striking plate.....	4 x ⅞ x 3 0	70
			4	Draw timber guards	5¾ x ⅝ x 0 6	14
			2	Draw bar pockets.....	4 x 1 x 3 8	98
			4	Follower plates.....	6 x 1½ x 0 8¾....	88
			4	Draw timber tie straps	2¼ x ⅝ x 1 11¾....	22
						385

SCHOEN ATTACHMENT—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	8	Dead blocks, buffer blocks and end sills.....	$\frac{7}{8}$″x 2′ 1 ″...	33
	1	1	4	Striking plate and buffer block.....	$\frac{3}{4}$ x 0 9 ...	5
	1	2	4	Carry iron and buffer block.....	$\frac{7}{8}$ x 1 3 ...	10
	1	2	4	" " draw timber and buffer block.....	$\frac{7}{8}$ x 1 $8\frac{7}{8}$ ...	14
	1	2	4	" " and buffer block.....	$\frac{7}{8}$ x 1 $8\frac{7}{8}$ ...	14
1	1	2	4	Draw timber and end sill	$\frac{7}{8}$ x 1 $9\frac{3}{8}$ ...	14
1		2	4	" " and sill at distance casting	$\frac{7}{8}$ x 1 11 ...	15
1		2	4	" " and " " tie strap.....	$\frac{7}{8}$ x 1 $9\frac{3}{4}$ ...	15
1		2	8	" " and sills.....	$\frac{7}{8}$ x 1 $9\frac{3}{8}$ ...	28
		2	8	Follower stops and guides	$\frac{7}{8}$ x $9\frac{3}{8}$ ...	13
			4	Drawbar pocket rivets.....	$1\frac{1}{8}$ x $11\frac{1}{2}$ ...	13
			4	Follower thimble rivets.....	$\frac{3}{4}$ x 5 ...	3
	1	1	4	Draw timber and guards.....	$\frac{5}{8}$ x $7\frac{1}{2}$ ...	3
	1	1	4	" " " "	$\frac{5}{8}$ x $8\frac{1}{2}$ ...	3
	1	1	24	Attachment to timbers.....	$\frac{5}{8}$ x $9\frac{1}{4}$ ...	28
	2	1	4	Draw timber tie bolts.....	$\frac{3}{4}$ x 1 10 ...	11
						222
					Forgings ...	385
						607

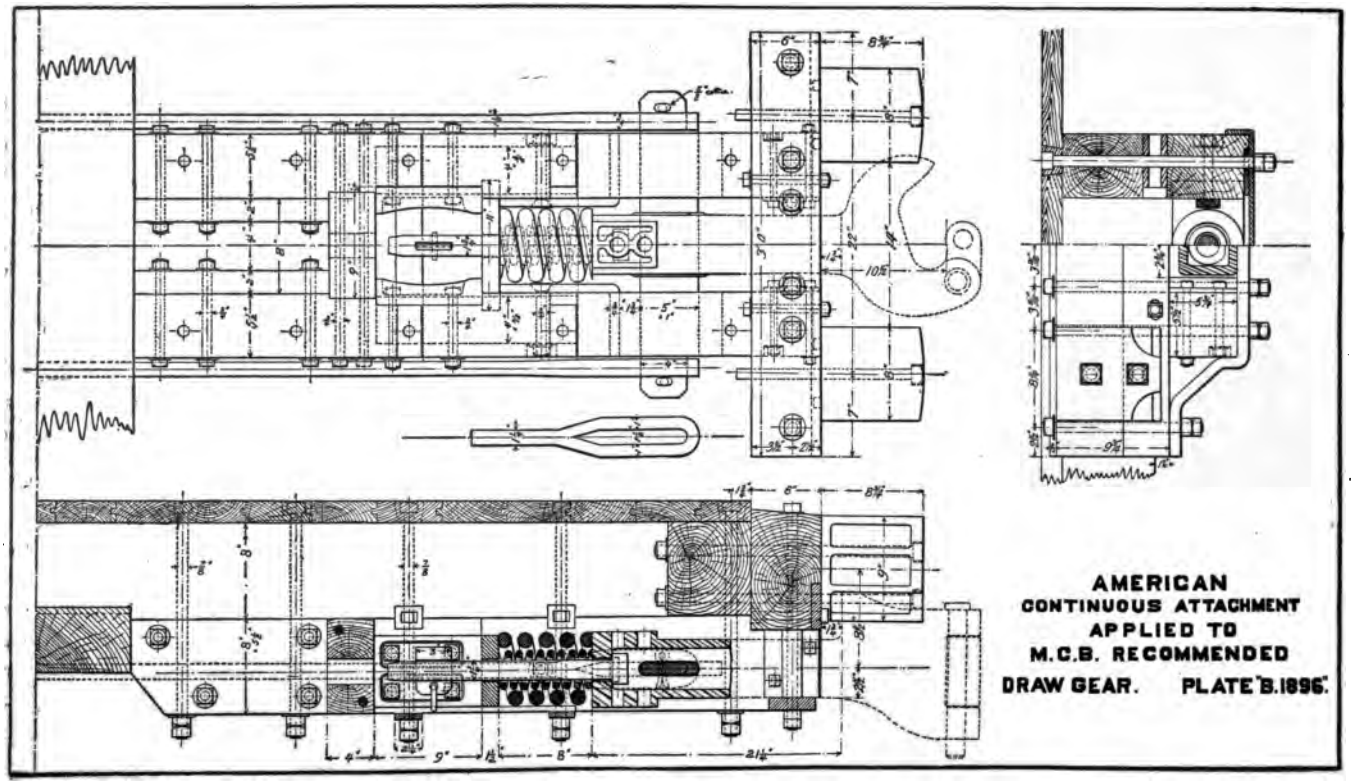
MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	The Schoen Steel Draft Attachment complete for one car, including bottom follower guides. All as manufactured by the Schoen Pressed Steel Co., Pittsburg, Pa.....	For $6\frac{1}{4}$″x8″ draw spring, and $1\frac{1}{2}$″ follower plates	....
2	Draw springs, double coil, capacity 19,000 lbs., $2\frac{1}{8}$″ free motion	$6\frac{1}{4}$″x8″	....
8	U. S. Standard square nuts.....	For $\frac{5}{8}$ bolt.....	1
32	" " " "	" $\frac{3}{4}$ "	8
88	" " " "	" $\frac{7}{8}$ "	33
			42
8	Wrought washers	For $\frac{5}{8}$″ bolt.....	1
36	" "	" $\frac{3}{4}$ "	4
24	" "	" $\frac{7}{8}$ "	3
			8
16	Nails for nut lock	2″ No. 9, B. W..	

SCHOEN ATTACHMENT—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
127	feet.	Lumber, white oak			
2	"	" pine			
383	lbs.	Castings, gray iron			
607	"	Wrought iron			
1	set.	Schoen steel draft attachm'nt			
2		Springs			
42	lbs.	Square nuts			
8	"	Wrought washers			
16		Nails, B. W			
		Labor:			
		Lumber yard			
		Mill			
		Blacksmith			
		Iron machine			
		Bolt room			
		Car builders			
		General labor			
		" expense			
		RECAPITULATION.			
		Material			
		Labor			
		General expense			



AMERICAN
CONTINUOUS ATTACHMENT
APPLIED TO
M.C.B. RECOMMENDED
DRAW GEAR. PLATE B.1896.

BILL OF ALL MATERIALS NECESSARY FOR THE APPLICATION OF THE AMERICAN CONTINUOUS ATTACHMENT TO THE 1896 M. C. B. RECOMMENDED DRAW GEAR,

Plate B.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
4	Draw timbers	Oak.	5½" x 8" x 4' 10½"	5¾" x 8¼" x 5' 3"	83'
2	" " dist. blk	"	4 x 8 x 0 9	4¼ x 8¼ x 1 0	6
2	Buffer blocks	"	6 x10¼ x 3 0	6¼ x 10¼ x 3 3	36
4	Rear stop timbers	"	2 x 8 x 1 4½	2¼ x 8¼ x 2 0	12
					137'

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Wt.
4	.....	Dead blocks	Gray Iron.	300
4	.....	Drawbar stops	" "	120
8	.....	Draw timber keys	" "	32
20	.....	⅞" inch socket washers	" "	35
				487

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Drawbar carry irons	4" x 1" x 3' 6"	93
			2	" striking plates	4 x ⅞ x 3 0	70
			4	Draw timber guards	5¾ x ⅜ x 0 6	14
			2	Follower plates	6 x 1½ x 11	55
			4	Follower supports	4 x ⅜ x 1 5	28
			4	Knee irons	2 x ¾ x 1 3½	26
			4	Draw timber tie straps	2¼ x ⅜ x 1 11¾	22
			4	Continuous rods, Loops	1½ x 1 x 2 4	47
			2	33' 1¼" inside Rods	1¼ x x31 3	256
			2	Drawbar tail bolts	1¾ x x 1 10½	30
			2	" " " keys	3 x ¼ x 0 6	3
			2	" " " " rings	¼ x 6½	1
			2	Draft irons	5 x 1 x 2 2	72
						717

AMERICAN CONTINUOUS ATTACHMENT—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	8	Dead block, buffer block and end sill	$\frac{7}{8}$" x 2' 1"	33
	1	1	4	Striking plate and buffer blocks	$\frac{5}{8}$ x 9	5
	1	2	4	Carry iron and buffer block	$\frac{7}{8}$ x 1 3	10
	1	2	4	" " draw timber and buffer block	$\frac{7}{8}$ x 1 $8\frac{7}{8}$	14
	1	2	4	" " and buffer block	$\frac{7}{8}$ x 1 $8\frac{7}{8}$	14
1	1	2	4	Draw timber and end sill	$\frac{7}{8}$ x 1 $9\frac{3}{8}$	14
1		2	8	Tie strap, draw timber and center sill	$\frac{7}{8}$ x 1 $9\frac{3}{4}$	29
1	1	2	8	Draw timber and center sill	$\frac{7}{8}$ x 1 $9\frac{3}{8}$	28
	1	1	4	" " guards and timber	$\frac{5}{8}$ x $7\frac{1}{2}$	3
	1	1	4	" " " " "	$\frac{5}{8}$ x $8\frac{1}{2}$	3
	1	1	16	" bar stops and timbers	$\frac{3}{4}$ x $8\frac{3}{8}$	17
	2	1	4	Draw timber tie bolts	$\frac{3}{4}$ x 1 10	11
	2	1	16	Rear stop timber and draw timber	$\frac{3}{4}$ x 1 $10\frac{1}{2}$	21
	1	1	4	Knee iron and draw timber, C. S. H	$\frac{3}{4}$ x $6\frac{1}{2}$	3
						205
					Forgings	717
						922

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	American Continuous Attachment, royalty, as furnished by the American Continuous Draw Bar Co., of Aurora, Ind.		
	Draw spring, double coil, 19,000 lbs., $2\frac{1}{8}$" free motion	$6\frac{1}{4}$ x8"	....
8	U. S. Standard square nuts	For $\frac{5}{8}$" bolt.	1
44	" " " "	" $\frac{3}{4}$ "	11
72	" " " "	" $\frac{7}{8}$ "	27
			39
8	Wrought washers	For $\frac{5}{8}$" bolt.	1
64	" "	" $\frac{3}{4}$ "	6
32	" "	" $\frac{7}{8}$ "	4
			11
4	Cotters for draw keys	$\frac{5}{8}$"x3"	....

AMERICAN CONTINUOUS DRAW GEAR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
137	feet.	Lumber, white oak.....		
487	lbs.	Castings, gray iron.....		
922	"	Wrought iron		
		Royalty.		
2		Springs		
39	lbs.	Square nuts		
11	"	Wrought washers.....		
4		Spring cotters.....		
		Labor :		
		Lumber yard.....		
		Mill.....		
		Blacksmith.....		
		Iron machine.....		
		Bolt room		
		Car builder.....		
		General labor.....		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor.....		
		General expense		
		Royalty		

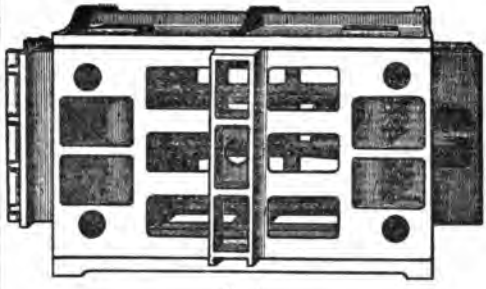
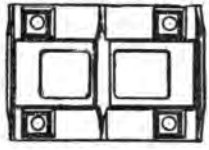


Fig. 1.



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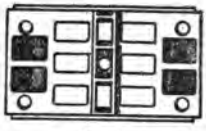


Fig. 5.

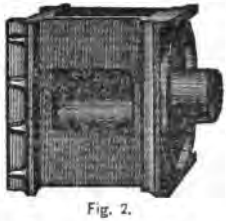


Fig. 2.

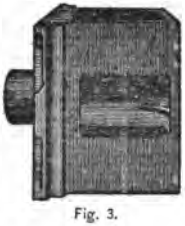


Fig. 3.

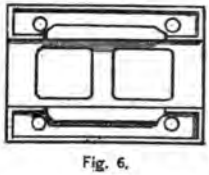


Fig. 6.

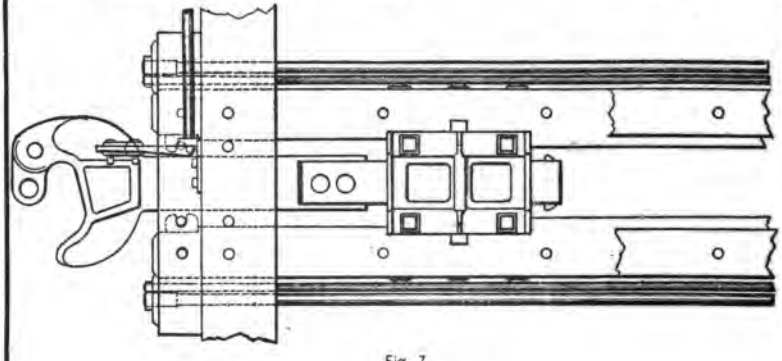


Fig. 7.

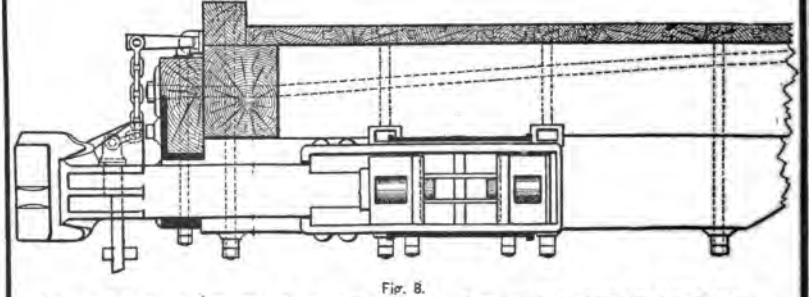


Fig. 8.

"CANDA" DRAWBAR ATTACHMENT

BILL OF ALL MATERIALS NECESSARY FOR THE APPLICATION OF THE CANDA ATTACHMENT TO THE 1896 M. C. B. RECOMMENDED DRAW GEAR, Plate B.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Draw timbers	Oak.	5½″x 8 ″x4′ 10½″	5¾″x 8¼″x 5′ 3″	83′
2	Buffer blocks	“	6 x10¼ x3 0	6¼ x10½ x 3 3	36
					119′

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Wt.
4	.....	Dead blocks	Gray Iron.	300
8	.....	Draw timber keys	“ “	32
20	.....	⅞″ socket washers	“ “	35
4	.....	Distance castings	“ “	12
				379

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Draw bar carry irons	4 ″x 1 ″x 3′ 6 ″	93
			2	“ “ striking plates	4 x ⅞ x 3 0	70
			4	“ “ timber guards	5¾ x ⅝ x 0 6	14
			2	“ “ pockets	4 x 1 x 4 8¼	126
			4	Draw timber tie straps	2½ x ⅝ x 1 11¼	22
			8	“ bar attachment washers	2 x ⅝ x 0 8	13
						338

CANDA ATTACHMENT—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Sizes of Blank.	Wt.
	1	1	8	Dead and buffer block to end sill	$\frac{7}{8}$″ x 2′ 1″	33
	1	1	4	Striking plate and buffer block	$\frac{3}{4}$ x 0 9	5
	1	2	4	Carry irons and buffer block	$\frac{3}{4}$ x 1 3	10
	1	2	4	" " draw timber and buffer block	$\frac{7}{8}$ x 1 $8\frac{7}{8}$	14
	1	2	4	" " and buffer block	$\frac{7}{8}$ x 1 $8\frac{7}{8}$	14
1	1	2	4	Draw timber and end sill	$\frac{7}{8}$ x 1 $9\frac{3}{8}$	14
1		2	4	Tie strap, draw timber and sill at distance block	$\frac{7}{8}$ x 1 11	15
1		2	4	Tie strap, draw timber and sill	$\frac{7}{8}$ x 1 $9\frac{3}{4}$	15
1	1	2	8	Draw timber and center sill	$\frac{7}{8}$ x 1 $9\frac{3}{8}$	28
			4	Drawbar pocket rivets	$1\frac{1}{8}$ x 0 $11\frac{1}{8}$	13
	1	1	4	Draw timber guards and draw timber	$\frac{5}{8}$ x 0 $7\frac{1}{2}$	3
	1	1	4	" " " " " "	$\frac{5}{8}$ x 0 $8\frac{1}{2}$	3
		2	8	Drawbar attachment, vertical bolt	$\frac{7}{8}$ x 1 $\frac{3}{4}$	17
	1	1	16	" " horizontal bolt	$\frac{7}{8}$ x 0 9	18
	1	1	4	" " " "	$\frac{5}{8}$ x 0 $6\frac{7}{8}$	2
						204
					Forgings	338
						542

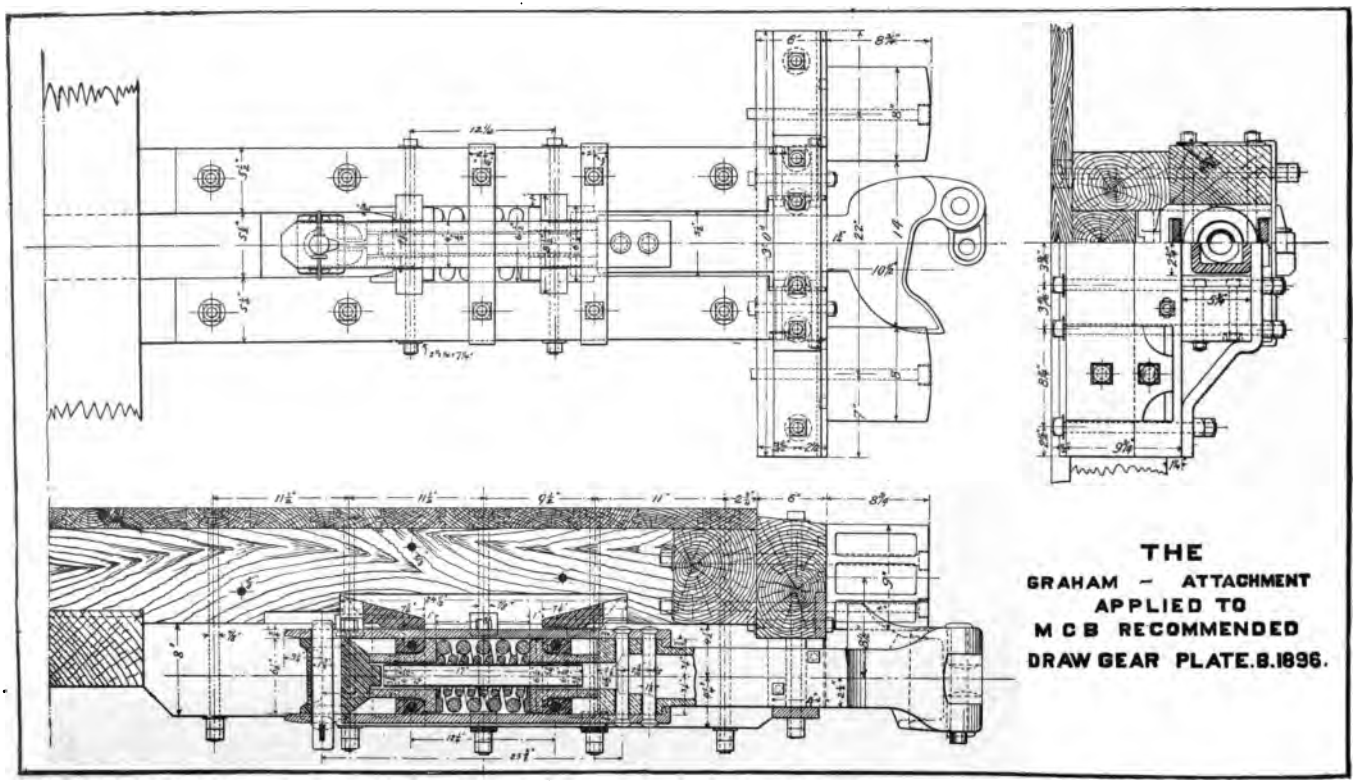
MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	The Canda drawbar attachment, complete for one car for $6\frac{1}{4}$″x8″ draw spring, all as supplied by C. J. & F. E. Canda, of No. 11 Pine St., New York City		
2	Drawbar springs, double coil, capacity 19,000 lbs., $2\frac{1}{8}$″ free motion	$6\frac{1}{4}$″x8″	....
12	U. S. Standard square nuts	For $\frac{5}{8}$″ bolt	2
20	" " " "	" $\frac{3}{4}$ "	5
88	" " " "	" $\frac{7}{8}$ "	33
			40
12	Wrought iron washers	For $\frac{5}{8}$″ bolt	1
20	" " "	" $\frac{3}{4}$ "	2
32	" " "	" $\frac{7}{8}$ "	4
			7

CANDA ATTACHMENT—(Continued).

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
119	feet.	Lumber, white oak.			
379	lbs.	Castings, gray iron.			
542	"	Wrought iron			
40	"	Square nuts.....			
7	"	Wrought washers			
2		Springs.....			
1	set.	Canda attachment.....			
		Labor :			
		Lumber yard.			
		Mill.			
		Blacksmith			
		Bolt room.			
		Iron machine.			
		Car builders.....			
		General labor			
		" expense.			
		RECAPITULATION.			
		Material.			
		Labor.			
		General expense.....			



THE
GRAHAM – ATTACHMENT
APPLIED TO
M C B RECOMMENDED
DRAW GEAR PLATE. B. 1896.

GRAHAM ATTACHMENT.

Bill of all Materials Necessary for the Application of the Graham Attachment to the M. C. B. Recommended Draw Gear,

(Plate B.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Draw timbers	Oak	5½" x 8¾" x 4' 10½"	5¾" x 9 " x 5' 3"	91'
2	Buffer blocks	"	6 x10¼ x 3 0	6¼ x10½ x 3 3	36
2	Center sill filling	Pine	5½ x 8 x 6 0	5¾ x 8¼ x 6 3	49
					176'

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Wt.
4	.....	Dead blocks	Gray Iron.	300
8	.....	Draw timber keys	" "	32
20	.....	1" socket washers	" "	35
2	.....	Tail strap castings	" "	50
4	.....	Check plates	" "	180
				597

FORGINGS.

C. W.	W. W	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Drawbar carry iron	4 " x 1 " x 3' 6 "	93
			2	" striking plate	4 x 7/8 x 3 0	70
			4	Draw timber guards	5¾ x 7/8 x 0 6	14
			4	Drawbar tail straps	4 x 3/4 x 2 9¾	113
			4	Draw timber tie straps	2¼ x 7/8 x 1 8½	19
			2	Drawbar tail strap bolts	1¾ x .. x 0 11	15
			2	" " " " keys	2 x ¼ x 0 6	2
			2	" " " " " rings	¼ x .. x 0 3¾	1
			8	Attachment bolt washers	2 x ¼ x 0 7¼	8
						335

GRAHAM ATTACHMENT—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	8	Dead and buffer block and end sill	$\frac{7}{16}$″ x 2′ 1 ″	33
	1	1	4	Striking plate and buffer block	$\frac{3}{8}$ x 0 9	5
	1	2	4	Carry iron and buffer block	$\frac{1}{2}$ x 1 3	10
	1	2	4	" " " " " and draw timber	$\frac{7}{16}$ x 1 $8\frac{7}{8}$	14
	1	2	4	" " " " "	$\frac{7}{16}$ x 1 $8\frac{7}{8}$	14
1	1	2	4	Draw timber and end sill	$\frac{7}{16}$ x 1 10	15
1	1	2	8	" " " center sill	$\frac{7}{16}$ x 1 $10\frac{1}{4}$	30
1	1	2	8	" " " " "	$\frac{7}{16}$ x 1 10	29
			4	Drawbar tail strap rivets	$1\frac{1}{4}$ x 0 11	12
	1	1	4	Draw timber guards	$\frac{5}{16}$ x 0 $6\frac{1}{2}$	2
	1	1	4	" " "	$\frac{5}{16}$ x 0 $7\frac{1}{2}$	3
	P	1	8	Attachment bolt	$\frac{5}{8}$ x 1 $7\frac{5}{8}$	20
	2	1	8	Filling block and center sill	$\frac{5}{8}$ x 1 $6\frac{3}{8}$	12
						199
					Forgings ...	335
						534

MISCELLANEOUS MATERIAL.

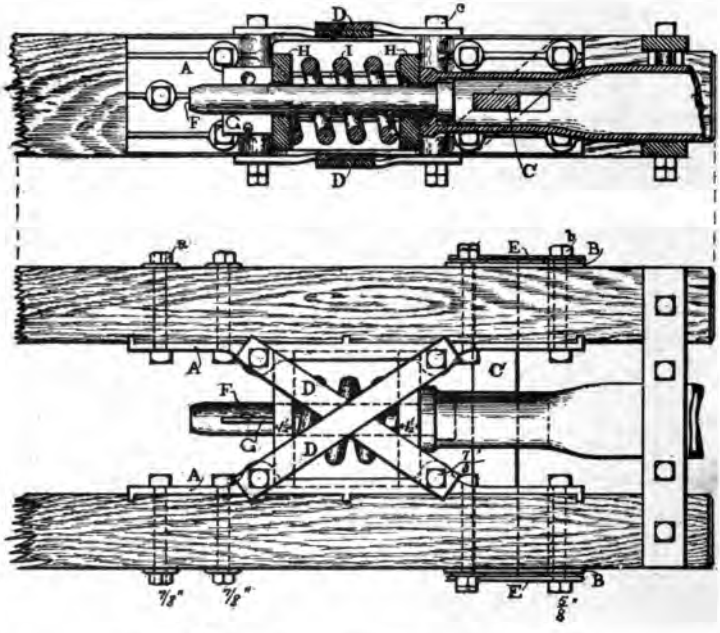
Per Car.	Description.	Size.	Wt.
4	Cast Steel Followers.	.....	68
	N. B.—These can be purchased from any good cast steel manufacturer as so much steel castings, provided the railroad company owns the right to use the device, otherwise they should be ordered through The Graham Draft Co., Cleveland, Ohio, who will furnish them at a price per car including the royalty.		
2	Draw springs, double coil, 19,000 lbs. capacity, $2\frac{1}{8}$″ free motion	$6\frac{1}{4}$″ x 8 ″	.....
2	Spring guides, boiler tube or light gas pipe.....	2″ outs'dx17″	.....
16	U. S. Standard Square Nuts	For $\frac{5}{8}$″ bolt.	2
12	" " " "	" $\frac{3}{4}$ "	3
72	" " " "	" $\frac{7}{8}$ "	27
			32
24	Wrought Iron Washers.	For $\frac{5}{8}$″ bolt.	2
4	" " "	" $\frac{3}{4}$ "	1
40	" " "	" $\frac{7}{8}$ "	5
			8

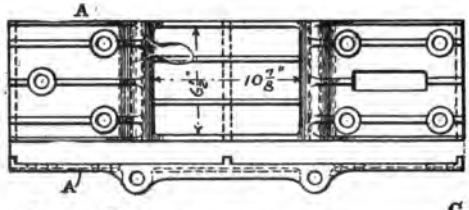
GRAHAM ATTACHMENT—(Continued.)

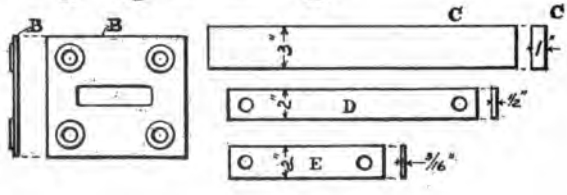
SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
49	feet.	Lumber, pine.			
127	"	" white oak.			
597	lbs.	Castings, gray iron.			
534	"	Wrought iron			
32	"	Square nuts			
8	"	Wrought washers			
68	"	Cast steel followers.			
		Royalty, if any.			
2		Springs			
2		" guides			
		Labor:			
		Lumber yard			
		Mill			
		Blacksmith			
		Bolt room			
		Iron machine.			
		Car builders			
		General labor			
		" expense			
		RECAPITULATION.			
		Material.			
		Labor.			
		General expense			

THE
HOEY DRAWBAR ATTACHMENT.







BILL OF ALL MATERIALS NECESSARY FOR THE APPLICATION OF THE HOEY ATTACHMENT TO THE 1896 M. C. B. RECOMMENDED DRAW GEAR,

(Plate B.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Draw timbers.....	Oak.	5½″x 8″x4′ 10½″	5¾″x 8¼″x 5′ 3″	83′
2	Distance blocks.....	"	4 x 8 x	4¼ x 8¼ x 1 0	6
2	Buffer blocks.....	"	6 x10¼x3 0	6¼ x10½ x 3 3	36
					125′

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Weight.
4	.....	Dead blocks.....	Gray Iron.	300
8	.....	Draw timber keys.....	" "	32
20	.....	⅞″ socket washers.....	" "	35
				367

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Weight.
			2	Drawbar carry irons.....	4″ x1″ x 3″ 6″	93
			2	" striking plates.....	4 x 7/32 x 3 0	70
			4	" timber guards.....	5¾ x 9/32 x 0 6	14
			4	" follower plates.....	6 x1½ x 0 8¾	88
			2	" tail pins	2 x 1 8	35
			2	" " " keys	3 x ½ x 0 8	7
			2	" " " " rings.....	3-16 x 0 6	1
			8	" diagonal straps.	2 x ½ x 1 6	40
			4	" timber tie straps.....	2¼ x 9/32 x 1 11¾	22
			2	" safety keys	3 x1 x 1 7	32
			4	" " straps	2 x3-16 x 0 8	3
						405

BOLTS.

[illegible]	Description.	[illegible]	[illegible]	[illegible]
[illegible]	Dees and cutter lock to end slit	[illegible]	[illegible]	[illegible]
[illegible]	Striking plate and cutter lock	[illegible]	[illegible]	[illegible]
[illegible]	Observation and cutter lock	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] raw runner and cutter lock	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] and cutter lock	[illegible]	[illegible]	[illegible]
[illegible]	Draw runner and end slit	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] enter slit and tie stud	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] and center slit	[illegible]	[illegible]	[illegible]
[illegible]	Diagonal stays and studs	[illegible]	[illegible]	[illegible]
[illegible]	Draw runner chains and draw runners	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Malleable lockets and [illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Draw runner tie rods	[illegible]	[illegible]	[illegible]
				[illegible]
		Forgings	[illegible]	[illegible]
				[illegible]

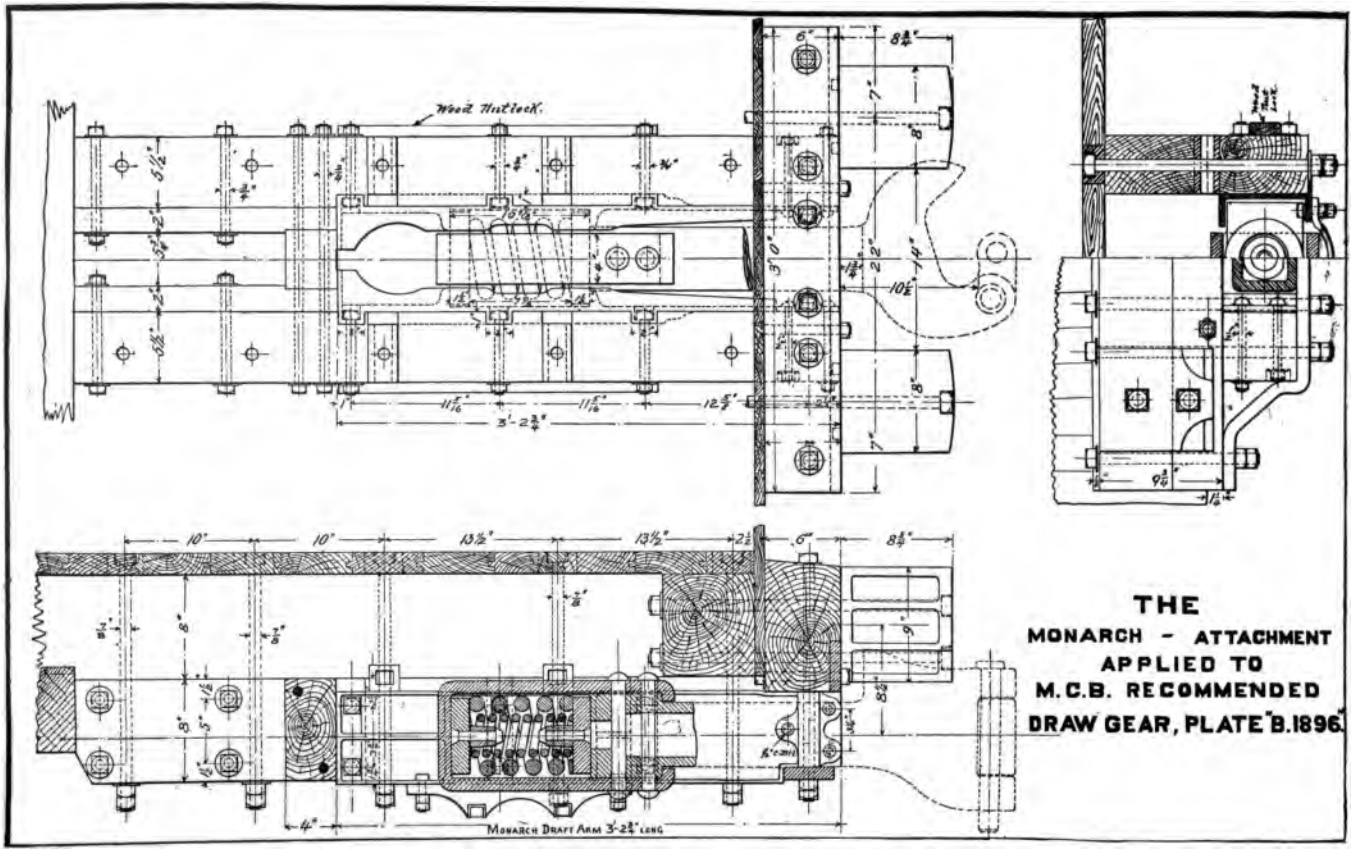
MISCELLANEOUS MATERIAL.

Per ar.	Description.	[illegible]	[illegible]	[illegible]
	Malleable iron [illegible] complete [illegible] draw springs, including—			
[illegible]	[illegible] lockets.			
[illegible]	[illegible] washers.			
	All manufacturers of the Devon Malleable Iron [illegible] Devon. Those who are not manufacturers, and whose location will be [illegible]			
[illegible]	Draw bar springs, [illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Pivoted washers	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

HOEY ATTACHMENT—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
125	feet.	Lumber, oak.		
367	lbs.	Castings, gray iron.		
168	"	" malleable iron for Hoey Attachment, including royalty		
636	lbs.	Wrought iron		
48	"	Square nuts		
8	"	Wrought washers		
2		Springs.		
		Labor:		
		Lumber yard.		
		Mill.		
		Blacksmith		
		Iron machine		
		Bolt room		
		Car builders		
		General labor		
		" expense.		
		RECAPITULATION.		
		Material.		
		Labor		
		Royalty		
		General expense		



THE MONARCH - ATTACHMENT APPLIED TO M.C.B. RECOMMENDED DRAW GEAR, PLATE "B.1896"

BILL OF ALL MATERIALS NECESSARY FOR THE APPLICATION OF THE MONARCH ATTACHMENT TO THE 1896 M. C. B. RECOMMENDED DRAW GEAR,

Plate B.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Draw timbers	Oak.	5½″ x 8 ″ x 4′ 10½″	5¾″ x 8¼″ x 5′ 3″	83′
4	Rear stop timbers	"	2 x 8 x 1 8	2¼ x 8¼ x 2 0	12
2	Distance blocks	"	4 x 8 x 0 6¾	4¼ x 8¼ x 0 9	4
2	Buffer blocks	"	6 x10¼ x 3 0	6¼ x10½ x 3 3	36
4	Nut locks	"	½ x 2⅜ x 2 0	1 x 3 x 2 3	2
					137′

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Weight.
4	.....	Dead blocks	Gray Iron.	300
8	.....	Draw timber keys	" "	32
20	.....	⅞″ socket washers	" "	35
4	.....	Follower thimbles	" "	4
				371

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Weight.
			2	Drawbar carry irons	4″x1 ″x 3′ 6″	93
			2	" striking plates	4 x ⅞ x 3 0	70
			2	" pockets	4 x1 x 3 8	98
			4	Follower plates	6 x1½ x 0 8¾	88
						349

MONARCH ATTACHMENT—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	8	Dead block, buffer block and end sill	$\frac{7}{8}$" x 2 ' 1 "	33
	1	1	4	Striking plate and buffer block	$\frac{1}{2}$ x 9	5
	1	2	4	Carry iron and buffer block	$\frac{1}{2}$ x 1 3	10
	1	2	4	" " draw timber and buffer block	$\frac{7}{16}$ x 1 $8\frac{7}{16}$	14
	1	2	4	" " and buffer block	$\frac{7}{16}$ x 1 $8\frac{7}{16}$	14
1	1	2	4	Draw timber and end sill	$\frac{7}{16}$ x 1 $9\frac{3}{16}$	14
1	1	2	16	Draw timber and center sills	$\frac{7}{16}$ x 1 $9\frac{3}{16}$	57
		2	8	Spider to stops	$\frac{3}{16}$ x $4\frac{3}{16}$	3
			4	Drawbar pocket rivets	$1\frac{1}{16}$ x $11\frac{1}{2}$	13
			4	Follower thimble rivets	$\frac{3}{4}$ x 5	3
	1	1	4	Attachment to draw timber, C. B.	$\frac{1}{2}$ x $7\frac{1}{2}$	2
	1	1	8	" " " "	$\frac{5}{16}$ x 7	3
	1	1	24	" " " "	$\frac{3}{8}$ x $8\frac{1}{2}$	24
	2	1	4	Draw timber tie bolts	$\frac{7}{16}$ x 1 $11\frac{3}{16}$	12
	2	1	16	Rear stop block and draw timber	$\frac{3}{4}$ x $10\frac{1}{2}$	21
						228
					Forgings ...	349
						577

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	The Monarch draft attachment complete for one car, including 4 side and 2 bottom castings, also royalty. All as furnished by the National Malleable Castings Co., of Toledo, O.	For $6\frac{1}{4}$"x8" Draw Spring	.....
2	Draw springs, double coil, capacity 19,000 lbs., $2\frac{1}{8}$" free motion	$6\frac{1}{4}$"x8"	.....
16	Nails for nutlock	2" No. 9	$\frac{1}{4}$
12	U. S. Standard square nuts	For $\frac{1}{2}$" bolt	1
16	" " " "	" $\frac{5}{8}$ "	2
48	" " " "	" $\frac{3}{4}$ "	12
72	" " " "	" $\frac{7}{8}$ "	27
			42
12	Wrought washers	For $\frac{1}{2}$" bolt	1
68	" "	" $\frac{5}{8}$ "	7
40	" "	" $\frac{7}{8}$ "	5
			13

MONARCH ATTACHMENT—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
137	feet.	Lumber, white oak.....		
371	lbs.	Castings, gray iron.....		
577	"	Wrought iron.....		
1	set.	Monarch Attachment complete, including royalty.....		
2		Springs.....		
¼	lbs.	B. W. Nails		
42	"	Square nuts.....		
13	"	Wrought washers.....		
		Labor :		
		Lumber yard.....		
		Mill.....		
		Blacksmith.....		
		Iron machine.....		
		Bolt room		
		Car builder.....		
		General labor.....		
		" expense		
		RECAPITULATION.		
		Materials.....		
		Labor		
		General expense.....		

CHAPTER V.

BODY BOLSTERS.

GENERAL.

The question of a strong and economical bolster is one that has given the various master car builders no little concern, and has resulted in no general decision as to what is considered the most preferable. There are many different methods of construction, all of which space prevents comparison in cost. Comparisons are, however, made of those which are most generally used, and which are enumerated as Wood trussed, Wrought iron, Pressed steel and Cast steel bolsters.

It should be noted that two bolts are included for securing each end of Bolster to side sill; in many cases, particularly with box cars, the vertical rod over bolster takes the place of one of these bolts.

Wood Trussed Bolsters.—Under this classification come all bolsters which are constructed of wood or wood and iron trussed, the details of which vary considerably. The illustration, however, shows the basis of our figure.

The method of trussing this bolster with rods only is sometimes considered insufficient and additional strength is obtained by application of fitch plates, channel bars, or I beams.

Wrought Iron Bolster.—Under this classification would come all iron bolsters, the details of which do not vary materially except as to size and method of applying the filling blocks or thimbles. The illustration presented shows the basis of our figures.

Pressed Steel Bolster.—Under this classification come all bolsters manufactured from pressed steel, of which there is but one in general use, namely, the Schoen Pressed Steel Bolster, the latest design of which is shown by the illustration accompanying the bill of materials; however,

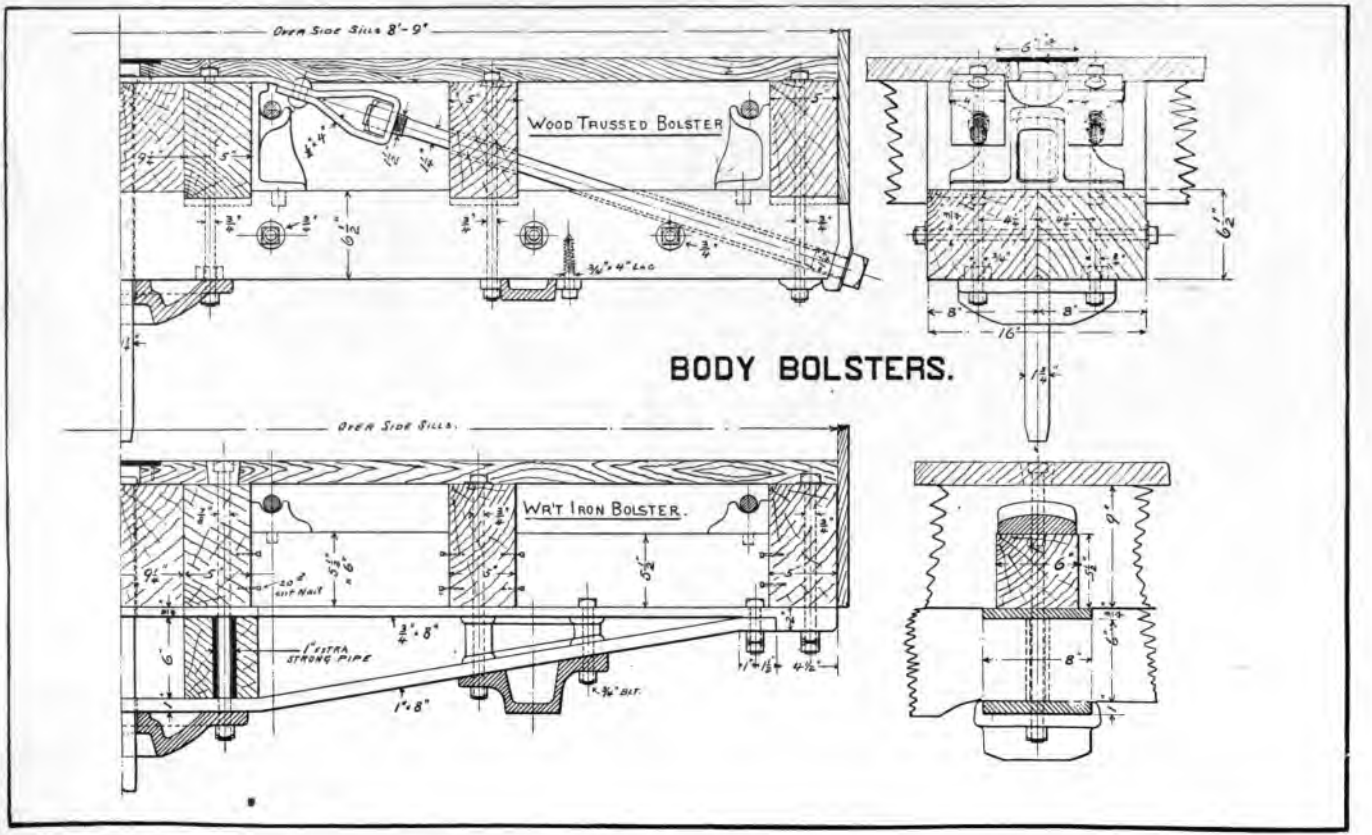
designs differing from this have heretofore been applied to a large number of cars.

Unless otherwise specified, this bolster is furnished complete with body center plates, side bearings, and truss rod saddles as shown. Some railroads, however, prefer to have these members made of gray or malleable iron; in either case, special attention should be called to the style required.

Cast Steel Bolster.—Under this classification should come all body bolsters manufactured from cast steel, of which there are a number in use. Like the pressed steel bolster, the body side bearings, and body center plates usually form a part of the construction and are furnished with the bolsters.

The illustration of the American steel bolster which is presented with the bill of materials, represents the only design obtainable, and differs from those manufactured by other steel foundries in so far as the top member is made of wrought iron and bolted to the bottom member instead of being in one piece.

It should be noted that the bill of material includes a wrought iron bar for top member 1⅛" thick as shown on the bolster company's drawings. It is a question for the engineer to decide whether this could not be made lighter for a 30-ton car.



BODY BOLSTERS.

WOOD TRUSSED BOLSTER.

Complete Bill of all Materials Necessary for the Application of Wood Trussed Bolsters to 30-ton Cars, 8′ 9″ Over Side Sills, Six Sills 9″ Deep.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Body Bolster m'brs	Oak	6½″x 8″ x 8′ 9″	6¾″x 8¼″x 9′ 0″	167′
2	King bolt blocks...	"	8 x 9¼ x 1 4	8¼ x 9½ x 1 6	20
					187′

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Wt.
4	.....	Bolster truss rod washers.....	Gray Iron.	80
2	.....	Body center plates.....	" "	132
4	.....	" side bearings	" "	66
4	.....	" bolster truss rod saddles.....	" "	106
4	.....	" truss rod saddles	" "	66
8	.....	Plain washers, ¾″ bolt.....	" "	6
				456

FORGINGS AND BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	King bolts	1¾″x " x 2′ 4″	37
			2	" " plates	6 x ¼ x 0 6	5
			4	Body bolster truss straps.....	4 x ½ x 5 6	147
			8	" " " " rivets.....	1 x 0 5	9
		1	8	" " " bolts	1¼ x 3 9	120
				(Head and 1½″ upset.)		
1	1	1	8	Body bolster and side sill	¾ x 1 6¼	18
	1	1	8	" " int. sill and side bear'g	¾ x 1 6¼	18
		1	8	" " cent. sill and cent. plate	¾ x 1 6¾	19
	2	1	12	" " tie bolts.....	¾ x 1 7	28
			4	" " and side bearing, lag..	⅝ x 0 5¾	2
						403

WOOD TRUSSED BOLSTER—(Continued.)

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
36	U. S. Standard Square Nuts...	For ¾" bolt.	9
8	" " " " ...	" 1½ "	13
			22
40	Wrought washers	For ¾" bolt.	4
8	F. H. Iron wood screws..... king-bolt plate.	1½" No. 16.	.....

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
187	feet.	Lumber, oak.....			
456	lbs.	Castings, gray iron.			
403	"	Wrought iron.....			
22	"	Square nuts.....			
4	"	Wrought washers.			
8		F. H. Iron wood screws....			
		Labor :			
		Lumber yard.....			
		Mill.			
		Blacksmith.			
		Iron machine.			
		Bolt room			
		Car builders			
		General labor.			
		" expense			
		RECAPITULATION.			
		Materials.....			
		Labor.			
		General expense			

WROUGHT IRON BODY BOLSTER.

Complete Bill of all Materials Necessary for the Application of Wrought Iron Body Bolster to 30 Ton Cars, 8′ 9″ Over Side Sills, 8″x3-4″ Top Members, and 8″x1″ Bottom Members, Six Sills 9″ Deep.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	(Extra) length of draw timbers	Oak..	5½″ x 8″ x	5⅝″ x 8¼″ x 2′ 6″	40′
4	Truss rod blocks	"	5½ x 6 x 1′ 2½″	5⅝ x 6¼ x 1 3	15
4	" " "	"	5½ x 6 x 1 6¼	5⅝ x 6¼ x 1 9	21
2	King bolt blocks	"	9 x 9¼ x 0 8	9¼ x 9½ x 0 9	11
					87′

CASTINGS.

Pcs.	Pattern.	Description.	Material.	Wt.
8	.....	Body truss rod saddles	Gray Iron.	75
2	.....	" center plates	" "	140
4	.....	" side bearings	" "	112
4	.....	" " " fillers	" "	38
8	.....	Cup washers, ⅞″ bolt	" "	12
				377

FORGINGS AND BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	King bolts	1¾″ x ..″ x 2′ 4″	37
			2	" " plates	6 x ¼ x 0 6	5
			2	Body bolster, top members	8 x ¾ x 9 9	390
			2	" " bottom members	8 x 1 x 8 3	440
	1	2	8	" " side sill	¾ x x 1 2½	15
		2	8	" " members together, end	¾ x x 0 5⅝	6
		1	4	" " and side bearings	¾ x x 0 7¾	4
	1	1	4	" " Int. sill and side bearing	¾ x x 1 6	9
C		1	4	" " center sill and center plate	½ x x 1 10½	15
C	1	2	4	Extra center sill and draw timber	⅞ x x 1 9¼	14
						935

WROUGHT IRON BODY BOLSTERS.—(Continued.)

MISCELLANEOUS MATERIAL.

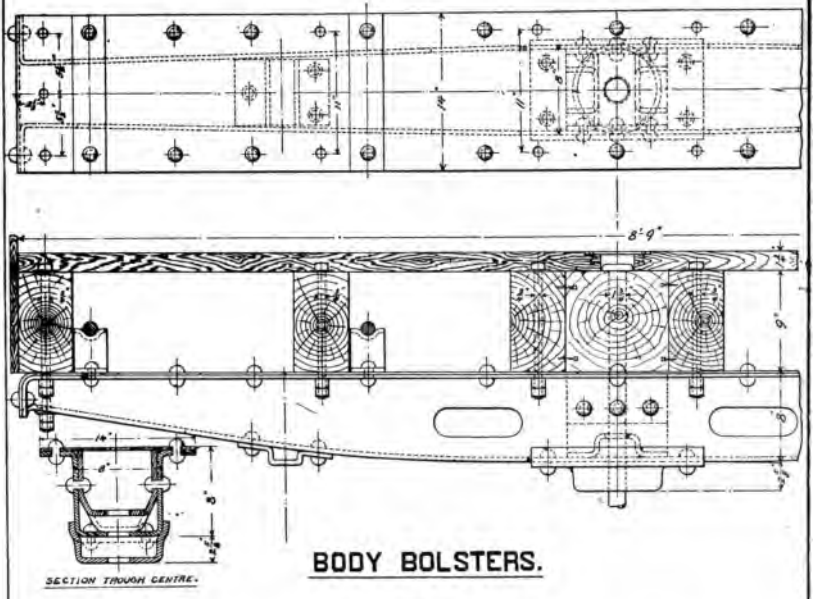
Per Car.	Description.	Size.	Wt.
40	U. S. standard square nuts	For ¾" bolt.	10
12	" " " "	" ⅞ "	4
			14
12	Wrought washers	For ¾" bolt.	1
4	" "	" ⅞ "	1
			2
4	Gas pipe thimbles for distance retainers at center sills	1" pipe 0' 6"	
64	Nails for truss rod blocks	20d cut.	3
8	F. H. iron wood screws, king bolt plate	1½" No. 16	

SUMMARY.

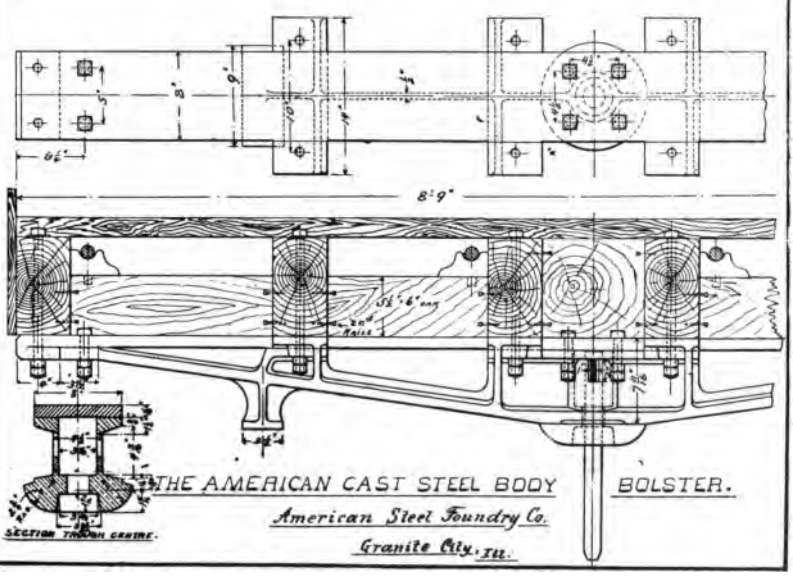
Quantity.	Specifications.	Price.	Am't.	
87 feet.	Lumber, oak			
377 lbs.	Castings, gray iron			
935 "	Wrought iron			
14 "	Square nuts			
2 "	Wrought washers			
3 "	Nails			
4	Pipe nipples			
8	F. H. iron wood screws			
	Labor:			
	Lumber yard			
	Mill			
	Blacksmith			
	Iron machine			
	Bolt room			
	Car builders			
	General labor			
	" expense			
	RECAPITULATION.			
	Material			
	Labor			
	General expense			

THE DIAMOND PRESSED STEEL BODY BOLSTER.

Schoen Pressed Steel Co.
Pittsburg, Pa.



BODY BOLSTERS.



THE AMERICAN CAST STEEL BODY BOLSTER.

American Steel Foundry Co.
Granite City, Ill.

SCHOEN PRESSED STEEL BODY BOLSTER.

Complete Bill of all Materials Necessary for the Application of the Schoen Pressed Steel Body Bolster to 30 ton Cars, 8′ 9″ over sills. Six sills, 9″ deep.

LUMBER.

Pcs.	Description.	Material.	Finished Size.	Rough Size.	B. M.
2	King bolt blocks.	Oak.	9 ″x9¼″x1′ 2 ″	9¼″x9½″x1 ′ 3″	18′

FORGINGS AND BOLTS.

C. W.	W. W	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	King bolts.	1¾″ x2 ′ 4 ″	37
			2	" " plates	6 x ¼ x0 6	5
	1	2	12	Bolster and side sill.....	¾ x1 4½	25
	1	2	8	" and intermediate sill	¾ x1 1⅜	13
	1	2	8	" and center sill	¾ x1 1⅜	13
						93

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
2	Schoen Pressed Steel Body Bolsters complete, including body center plates, body side bearings, and body truss rod saddles, all arranged for cars with six sills 8′ 9″ overside sills and holes for two ¾″ bolts at each intersection. All as supplied by the Schoen Pressed Steel Co., of Pittsburg, Pa..	.....	.....
56	U. S. Standard Square Nuts	For ¾″ bolt.	14
24	Wrought washers	" ¾ "	2
8	Flat head iron wood screws for King Bolt Plates..	1½″ No. 16.	.....

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
18	feet ..	Lumber, oak.....	.....	.....
93	lbs ...	Wrought iron.	.....	.....
2		Schoen pressed steel body bolsters	.....	.....
14	lbs ...	Square nuts.....	.....	.....
2	" ...	Wrought washers.....	.....	.....
8		Flat head iron wood screws.....	.....	.....
		Labor.		
		Lumber yard.....	.....	.....
		Mill	.....	.....
		Blacksmith	.....	.....
		Bolt room.....	.....	.....
		Iron machine.....	.....	.....
		Car builders.....	.....	.....
		General labor.	.....	.....
		General expense.	.....	.....
		RECAPITULATION.		
		Materials	.....	.....
		Labor	.....	.....
		General expense.....	.....	.....

AMERICAN CAST STEEL BODY BOLSTER.

Complete Bill of all Materials Necessary for the Application of the American Cast Steel Body Bolster to 30 Ton Cars, 8′ 9″ over Side Sill, Six Sills 9″ deep.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
2	King bolt blocks	Oak.	9 ″x9¼″x0′ 8 ″	9¼″x9½″x0′ 9″	11
4	Truss-rod "	"	5½ x6 x1 2½	5½ x6¼ x1 3	15
4	" "	"	5½ x6 x1 6¼	5¾ x6¼ x1 9	21
					47

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Wt.
8	.....	Body truss-rod saddles	Gray Iron.	75

FORGINGS AND BOLTS.

C. W.	W. W	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Body bolster top plate.....	8 ″x1⅛″x9′ 4½″	563
			2	King bolts.....	1¾ x 1 3	20
			2	" " key.....	2½ x ⅜ x0 8	4
	1	2	8	Body bolster and side sill.....	⅝ x 1 3¼	15
		2	8	" " members together, end	¾ x 0 8	8
	1	2	8	" " and intermediate sill	⅝ x 1 3	15
	1	2	8	" " and center "	⅝ x 1 3	15
		2 Hx.	8	" " members together, center ..	¼ x 0 8	8
						648

MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
2	American Cast Steel Body Bolsters, complete, including body members, body center plates, and body side bearings, all arranged for car with six sills 8′ 9″ over side sills and holes for ¾″ bolts, two at each intersection.....	.....	.....
	All as supplied by the American Steel Foundry Co. of Granite City, Ill	.....	.....
16	U. S. Standard Hex. nuts.....	For ¾″ bolt..	4
64	" " square "	" ¾ " ..	16
24	Wrought iron washers	" ¾ " ..	2
80	Nails for blocking	20 d cut	3½

AMERICAN CAST STEEL BODY BOLSTER—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
47	feet.	Lumber, oak			
75	lbs.	Castings, gray iron			
648	"	Wrought iron			
2		American cast steel body bolsters			
4	lbs.	Hexagon Nuts			
16	"	Square nuts			
2	"	Wrought washers			
3½	"	20d cut nails			
		Labor :			
		Lumber yard			
		Mill			
		Blacksmith			
		Iron machine			
		Bolt room			
		Car builder			
		General labor			
		" expense			
		RECAPITULATION.			
		Materials			
		Labor			
		General expense			

CHAPTER VI.

BRAKES.

A few years ago the question of brakes would have been more difficult to deal with than it is to-day, particularly because the M. C. B. Association have adopted a standard which meets with universal approval, varying only when it is absolutely necessary to meet the conditions under which it must be applied.

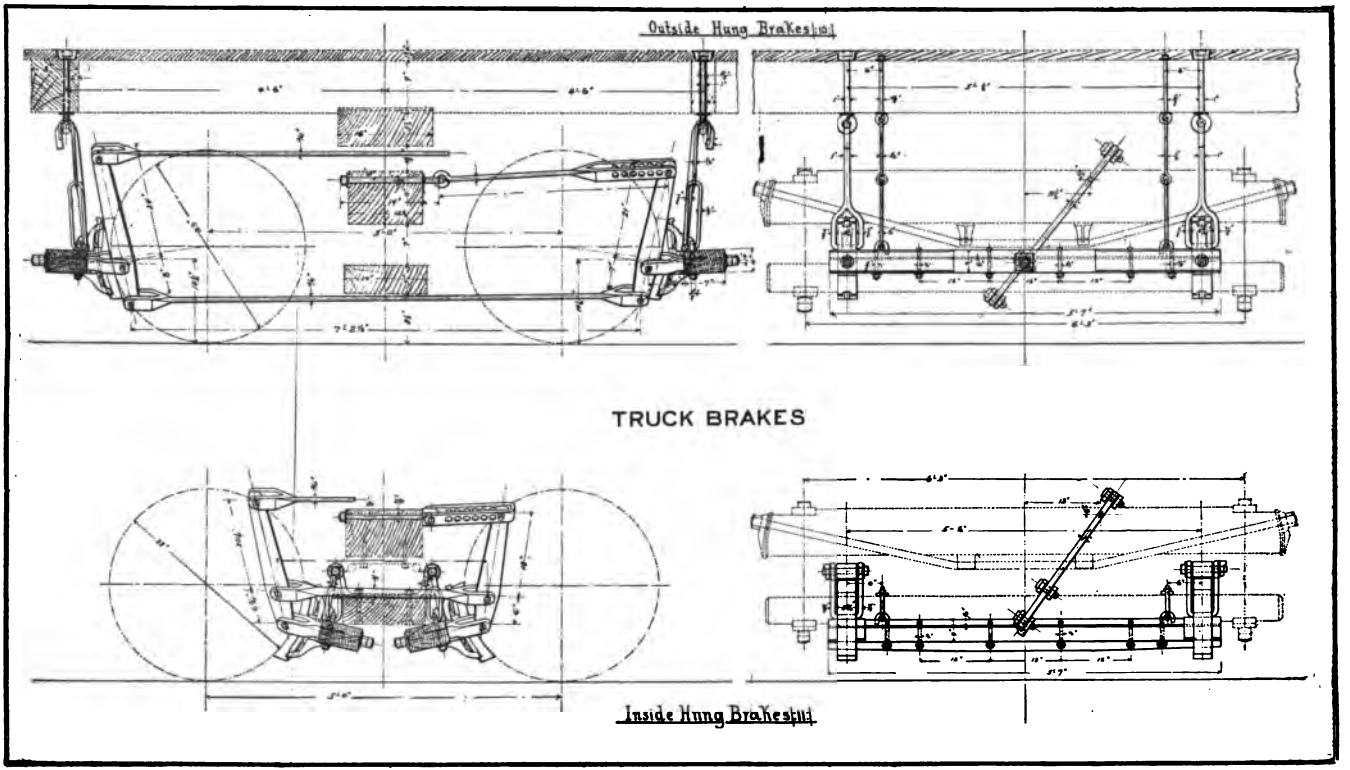
Since it is soon to become a law requiring that all cars be equipped with air brakes of an approved pattern it is seldom that a new car is built without at least having double brakes applied to conform to M. C. B. Standard, thus facilitating the application of the cylinder and such other parts as are necessary to make an air brake car without disturbing the parts that have already been applied.

The question of brake beams is one upon which opinion differs very widely. Many master car builders have decided that nothing but a metal brake beam, of which there are many now on the market, is sufficiently strong to withstand the sudden strain incident to the emergency application of the air brakes, while other master car builders are of the opinion that plated or trussed wood beams are fully up to requirements, and under certain conditions preferable.

The opinion of our master car builders is also very much divided as to whether the brakes should be hung to the body or to the trucks. Very strong arguments are presented in favor of both methods.

So many alternative figures are required in regard to brakes that the following bills of materials are designed to meet those conditions, as subdivisions clearly indicate.

The accompanying illustrations showing brakes hung to car body and trucks, the body arrangement of levers and connections with air and without air for straight bottom cars, are for equipment of about 30,000 lbs. light weight on rails. For any deviation from this weight, a proportionate change in length of levers should be made.


Outside Hung Brakeshoe
TRUCK BRAKES
Inside Hung Brakeshoe

BRAKES HUNG FROM TRUCKS.

Complete bill of all materials necessary for the application of Brakes hung from Trucks, based on the use of M. C. B. standard sizes of levers and connections, and application to a straight-bottom car of about 30,000 lbs. weight, and of the following general dimensions:

Length over end sill	34′	0″
Outside of end sill to center of bolster	5	0
Center to center of cross ties	8	0
Wheel base	5	0

See illustration, page 166

LUMBER.

Pcs.	Description.	Mat'l.	Finished Sizes.	Rough Sizes.	B. M.
	When Air is applied only.				
1	Cylinder block	Oak.	$3\frac{1}{2}$″x13″x1′ $10\frac{1}{2}$″	$3\frac{3}{4}$″x13$\frac{1}{4}$″x2′ 0″	
1	Reservoir block	"	$3\frac{1}{2}$ x 4 x1 $10\frac{1}{2}$	$3\frac{3}{4}$ x 4$\frac{1}{4}$ x2 0	
					11
	When air is applied and Cars have Center Sill stiffners only.				
1	Intermediate sill furring	Oak.	4″x5″x7′ 8″	4$\frac{1}{4}$″x5$\frac{1}{4}$″x8′ 0″	15′
	When Wood Beams are used only.				
4	Beams	Oak or Hick'ry.	4″x7″x5′ 7″	4$\frac{1}{4}$″x7$\frac{1}{4}$″x5′ 9″	59′
	When Platform is used on end of Car only.				
1	Platform	Oak.	1$\frac{3}{4}$″x8$\frac{3}{4}$″x3′ 0″	2″x9″x3′ 0″	5′
1	" bracket furring	"	3 x4	3$\frac{1}{4}$ x4$\frac{1}{4}$ x3 0	3
					8′
1	Floating lever fulcrum bl'ck	Oak.	4″x6″x 1′ 7$\frac{1}{4}$″	4$\frac{1}{4}$″x6$\frac{1}{4}$″x1′ 9″	4′
	When Hanger Blocks are required for Inside Brakes only.				
4	Hanger blocks	Oak.	4″x9″x1′ 10$\frac{3}{8}$″	4$\frac{1}{4}$″x9$\frac{1}{4}$″x2′ 0″	26′

RECAPITULATION.

For double brakes without air, metal beams	4′
" " " " " wood "	63
" " " with " metal "	15
" " " " " wood "	74
" " " " " (for car with sill stiffner) add	15
" Application of end platform to either, add	8
" Inside brakes requiring hanger blocks to either, add	26

BRAKES HUNG FROM TRUCK—(Continued.)

CASTINGS.

Pcs.	Patterns.	Description.	Material.	Wt.
1	.....	Wheel	Gray iron.	19
1	.....	Ratchet wheel	" "	7
1	.....	" " pawl	" "	3
1	.....	Shaft guide at end sill	" "	3
8	.....	Shoes (M. C. B. Christie)	" "	148
				180

For Cars requiring Hanger Blocks, with Inside Brakes only.

8	.....	Plain washers for $\frac{5}{8}$" bolt	Gray iron.	3

For Cars with Wood Plated Beams only.

8	.....	Heads	Gray iron.	152

For Box or Stock Car, add to the above

1	.....	Shaft guide at girth	Gray iron.	3
1	.....	" " " roof	" "	11
				14

RECAPITULATION.

For double brakes, metal beams	180
" " " plated wood beams	332
" box or stock car, add to either	14
" cars requiring hanger blocks with inside brakes, add	3

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			1	Brake shaft drum	$1\frac{1}{2}$"x " 1'3 "	7
	1	1	1	" " (end $\frac{3}{4}$" threaded)	$1\frac{1}{4}$ x 3 0	12
			1	" " key	$\frac{3}{8}$ x $\frac{3}{8}$ x0 $2\frac{1}{2}$	1
				(Shaft is supported by extended carry iron.)		20
			1	For coal or flat car, add	4 x $\frac{1}{2}$ x1 0	7
			1	" box or stock car, add	$1\frac{1}{4}$ x 6 9	27
			8	Hangers	$\frac{7}{8}$ x 2 9	44
			4	" carriers	$3\frac{1}{2}$ x $\frac{3}{4}$ x2 6	88
	1	1	8	Safety hangers, hooks	$\frac{5}{8}$ x $11\frac{5}{8}$	8
			8	" " links	$\frac{5}{8}$ x 1 2	9
			4	" " carriers	2 x $\frac{1}{2}$ x1 5	19
				(Continued.)		168

BRAKES HUNG FROM TRUCK—(Continued.)

FORGINGS—(Continued.)

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			1	Cylinder lever, 20″, 9″ and 7″ ctrs.....	3½″x1 ″x 2′ 11 ″	34
			1	Floating " 6½″ and 14½″ "	3½ x1 x 1 10	21
			3	Lever guides	1 x 3 7	28
			1	Floating lever fulcrum... .....)	2½ x ½ x 2 4¼	10
			1	" " " bracket.....)	2½ x ½ x 1 0	4
			1	Hand connection, 13′ ½″.....) rod ..	⅝ x 13 ½	20
			2	from center to inside hook.....) jaws .	2½ x ¾ x 0 9	9
			1	Upper lever connection.....) rod ..	⅝ x 9 9½	15
			4	10′ 11¼″ center, brake end.....) jaws .	2½ x ¾ x 0 9	19
			1	Upper lever connection.....) rod ..	⅝ x 10 1½	15
			4	8′ 7″ centers, opposite end.....) jaws .	2½ x ¾ x 0 9	19
			1	Cylinder connection.....) rod ..	⅝ x 6 6¾	10
			4	7′ 8¾″ centers.....) jaws .	2½ x ¾ x 0 9	19
				Chain, eye-bolt and link. (See Miscel.)		223
			2	Live levers, 6¾″ and 20¼″ centers.....	4 ″x1 ″x 2′ 2 ″	58
			2	Dead " 6 " and 18 "	4 x1 x 1 11	51
			2	Lower connections.....) rods..	1½ x 1 2	14
			8	2′ 11½″ centers .....) jaws .	2½ x ¾ x 1 0	50
			2	Dead lever guides.....	2½ x ½ x 2 7	22
	1	1	2	" " " anchors	2½ x1 x 0 7	10
			8	Shoe keys.....	⅞ x ½ x 0 10	10
						215
			1	Push rod.....) rod ..	1⅜″x ″ 1 ′ 8½″	8
			2	27½″ from center to end.....) jaws .	2½ x ¾ x 10½	11
			1	Release valve rod	⅝ x 5 6	2
			1	" " "	⅝ x 3 6	1
			2	" " " guides.....	1 x ¼ x 0 6	1
			2	Pipe clamps at end sill	1½ x ½ x 6½	3
			2	" " " " "	1½ x ⅜ x 8½	3
			2	" " " bolster	1½ x ⅝ x 1 2	4
			2	" " " cross tie.....	1½ x ⅜ x 0 8	3
			2	Dummy coupler brackets.....	1½ x ⅝ x 0 6	2
			2	" " " links.....	⅝ x 1 0	1
				[Attached by carry iron bolt.]		39
		2	4	Beam fulcrums, 1″ shank.....	2 (2½″x ¾″x0′ 11 ″)	46
			4	" " washers	3 x ¼ x0 3	3
			4	" plates	4 x ¼ x5 6¾	74
			8	" guides	⅞ x 10½	14
						137
				Platform brackets:		
			2	Brackets	1¾″x ⅜″x 2′ 6 ″	11

BRAKES HUNG FROM TRUCK—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Brake shaft guide, lag	$\frac{1}{2}$"x ′ $4\frac{3}{4}$"	1
	1		1	" " pawl, "	$\frac{5}{16}$ x0 8	1
						2
				For flat or gondola car, add:		
	1	1	2	Brake shaft bracket to end sill	$\frac{5}{16}$ x1 $1\frac{3}{8}$	2
				For box or stock car, add:		
			2	Center guide to end girth, lag	$\frac{1}{4}$ x0 $4\frac{3}{4}$	1
			1	Top " " roof	$\frac{5}{16}$ x0 $6\frac{1}{4}$	1
	1	1	2	" " " "	$\frac{5}{16}$ x0 $6\frac{3}{4}$	1
						3
2		2	4	Hanger block tie rods	$\frac{5}{16}$ x2 $8\frac{7}{8}$	11
				(Only when cars with inside brakes require hanger blocks)		
	2 Key		8	Hanger and carrier key bolt	1 x0 $9\frac{1}{2}$	17
			8	Safety hanger, carrier and spring plank, lag	$\frac{1}{4}$ x0 $4\frac{1}{4}$	2
	1	1	8	Hanger carrier to spring plank	$\frac{3}{4}$ x0 $7\frac{5}{8}$	7
						26
			12	Lever guides to sills, lag	$\frac{1}{4}$ x0 $4\frac{3}{4}$	3
	2	1	2	Floating lever fulcrum block to sill	$\frac{5}{16}$ x1 $4\frac{7}{8}$	3
	1	1	4	" " " to cross tie and blk	$\frac{5}{16}$ x0 $6\frac{1}{2}$	1
			2	" " " rivets	$\frac{5}{16}$ x0 4	1
	Cot.		8	Connection pins	$1\frac{1}{8}$ x $4\frac{1}{2}$	10
						18
	Cot.		12	Connection pin	$1\frac{1}{8}$ x0 $4\frac{1}{2}$	15
	2	1	4	Cylinder and reservoir block to sill	$\frac{5}{16}$ x1 $1\frac{3}{4}$	5
	1	1	4	" " " "	$\frac{5}{16}$ x1 $2\frac{3}{8}$	5
	1	1	4	" " " to block	$\frac{5}{16}$ x0 $6\frac{3}{4}$	2
			14	Pipe clamps, lag	$\frac{1}{2}$ x0 $4\frac{3}{4}$	4
	Cot.		1	Connection pin	$1\frac{1}{8}$ x0 $4\frac{1}{2}$	1
						17
	1	1	16	Plates to beams, C. B	$\frac{3}{4}$ x0 $5\frac{1}{2}$	5
	1	2	8	Heads " "	$\frac{3}{4}$ x0 $10\frac{1}{2}$	10
						15
		1	4	Platform and bracket, C. B	$\frac{1}{2}$ x0 $3\frac{1}{2}$	1
		2		Bracket to car, lag	$\frac{1}{2}$ x0 $4\frac{1}{2}$	1
		1	2	" " " C. B	$\frac{1}{2}$ x0 $5\frac{1}{2}$	1
	1	2		Change pawl lag to bolt if this step is used		3

RECAPITULATION.

C. W.	W. W.	Nuts.	Pcs.	Description.		Wt.
				For shaft and fittings.	Forgings.	20
					Bolts	2
						22
				For hanger and safety chains..	Forgings.	168
					Bolts	26
						194
				For M. C. B. std. form double brakes, body.....	Forgings.	223
					Bolts	18
						241
				For M. C. B. std. form double brakes, truck	Forgings.	215
					Bolts	15
						230
				For application of air.....	Forgings.	39
					Bolts	17
						56
				For wood "plated" beams.	Forgings.	137
					Bolts ...	15
						152
				For end platform.....	Forgings.	11
					Bolts	3
						14
				If applied to flat or gondola car, add	Forgings.	7
					Bolts	2
						9
				If applied to box or stock car, add.	Forgings.	27
					Bolts	3
						30
				Total of above for Flat or Gondola car..		918
				Total of above for box or stock car.....		939
				For car with hanger blocks and inside brakes, add		11

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	For Shaft and Fittings:		
1	U. S. Standard square nut	For ¾" bolt.	¼
1	Wrought washer	" ¾ "	⅛
1	Spring cotter for brake shaft	¼"x2"	....
	Hangers and Safety Chain:		
8	U. S. Standard square nuts	For ⅝" bolt.	1¼
8	" " " "	" ¾ "	2
8	Wrought washers	" ⅝ "	⅝
8	" "	" ¾ "	¾
16	" "	" 1 "	2⅝
8	Keys "split riveted" for h'gr key bolt	9/16"x2½"	....
	M.C.B. Form Double Brakes, Body:		
6	U. S. Standard square nuts	For ½" bolt.	½
2	" " " "	" ⅝ "	¼
4	Wrought washers	" ½ "	⅛
4	" "	" ⅝ "	¼
8	Spring cotters for connection pins	⅜"x 2¼"	....
1	Chain, eye-bolt and link complete	⅜ x24	....
	M.C.B Form Double Brakes, Truck:		
2	U. S. Standard square nuts	For ⅞" bolt.	¾
2	Wrought washers	" ⅞ "	¼
12	Spring cotters for connection pins	⅜"x2¼"	
	For Application of Air:		
12	U. S. Standard square nuts	For ⅝" bolt.	1¾
16	Wrought washers	" ⅝ "	1¼
1	Spring cotter for connection pin	⅜"x2¼"	....
1 set.	Automatic brakes complete		
38 feet	Train pipe	1¼"	....
20 "	Ret'ng pipe (add 10' for box or st'k car)	⅜	....
1	Pipe nipple	1 "x6 "	....
1	Reducing ell	1 x1¼	....
1	Straight "	1¼ x1¼	....
1	" "	⅜ x ⅜	....
1	Union	⅜	....
6	Retaining pipe staples		
4	Screws for release rod guide	1½", No. 14	....

(Continued.)

BRAKES HUNG FROM TRUCK—(Continued.)

MISCELLANEOUS MATERIALS—(Continued.

Per Car.	Description.	Size.	Wt.
	For wood plated beams:		
16	U. S. standard square nuts	For $\frac{1}{2}$" bolt	$1\frac{1}{4}$
16	" " " "	" $\frac{5}{8}$" "	4
8	" " " "	" 1" "	$4\frac{1}{4}$
16	Wrought washers	" $\frac{1}{2}$" "	$\frac{1}{2}$
8	" "	" $\frac{5}{8}$" "	$\frac{3}{4}$
	For end platform:		
6	U. S. standard square nuts	" $\frac{1}{2}$" "	$\frac{1}{2}$
2	" " " "	" $\frac{5}{8}$" "	$\frac{1}{2}$
2	Wrought washers	" $\frac{5}{8}$" "	$\frac{1}{4}$
8	U. S. Standard square nuts (For cars requiring hanger blocks with inside brakes)	" $\frac{5}{8}$" "	$1\frac{1}{4}$

RECAPITULATION.	$\frac{1}{2}$"	$\frac{5}{8}$"	$\frac{3}{4}$"	$\frac{7}{8}$"	1"	Total Wt.
U. S. standard square nuts:						
Shaft and fittings			1			$\frac{1}{4}$
Hanger and safety chain		8	8			$3\frac{1}{4}$
M. C. B. form, body	6	2				$\frac{3}{4}$
" " truck				2		$\frac{3}{4}$
Application of air		12				$1\frac{3}{4}$
Plated beams	16		16		8	$9\frac{1}{2}$
End platform	6		2			1
	28	22	27	2	8	$17\frac{1}{4}$
For hanger blocks, add		8				$1\frac{1}{4}$
		30				$18\frac{1}{2}$
Wrought iron washers:						
Shaft and fittings			1			$\frac{1}{8}$
Hangers and safety chain		8	8		16	4
M. C. B. form, body	4	4				$\frac{3}{8}$
" " truck				2		$\frac{1}{4}$
Application of air		16				$1\frac{1}{4}$
Plated beams	16		8			$1\frac{3}{8}$
End platform			2			$\frac{1}{4}$
	20	28	19	2	16	$7\frac{5}{8}$

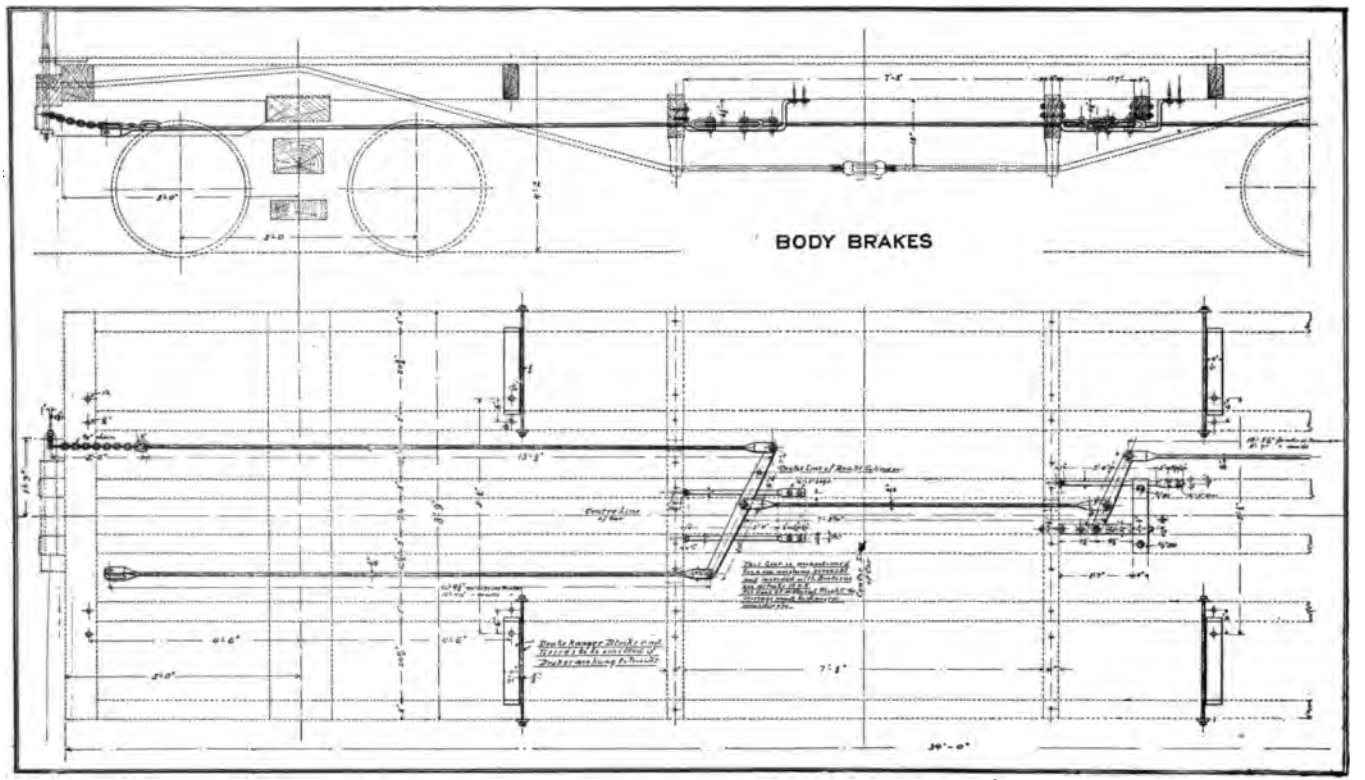
8	Split keys for hanger pins	$\frac{3}{16}$" x $\frac{3}{4}$" x $2\frac{1}{2}$"	
21	Spring cotters for connections	$\frac{3}{8}$ x $2\frac{1}{4}$	....
1	" " " brake shaft	$\frac{1}{2}$ x 2	....
1	Brake chain	$\frac{3}{8}$ x24	....
1 Set	Air brake equipment		
	Pipe and fittings	See details	....
6	Pipe staples		
4	Screws for release rod guides	$1\frac{1}{2}$" No. 14	..

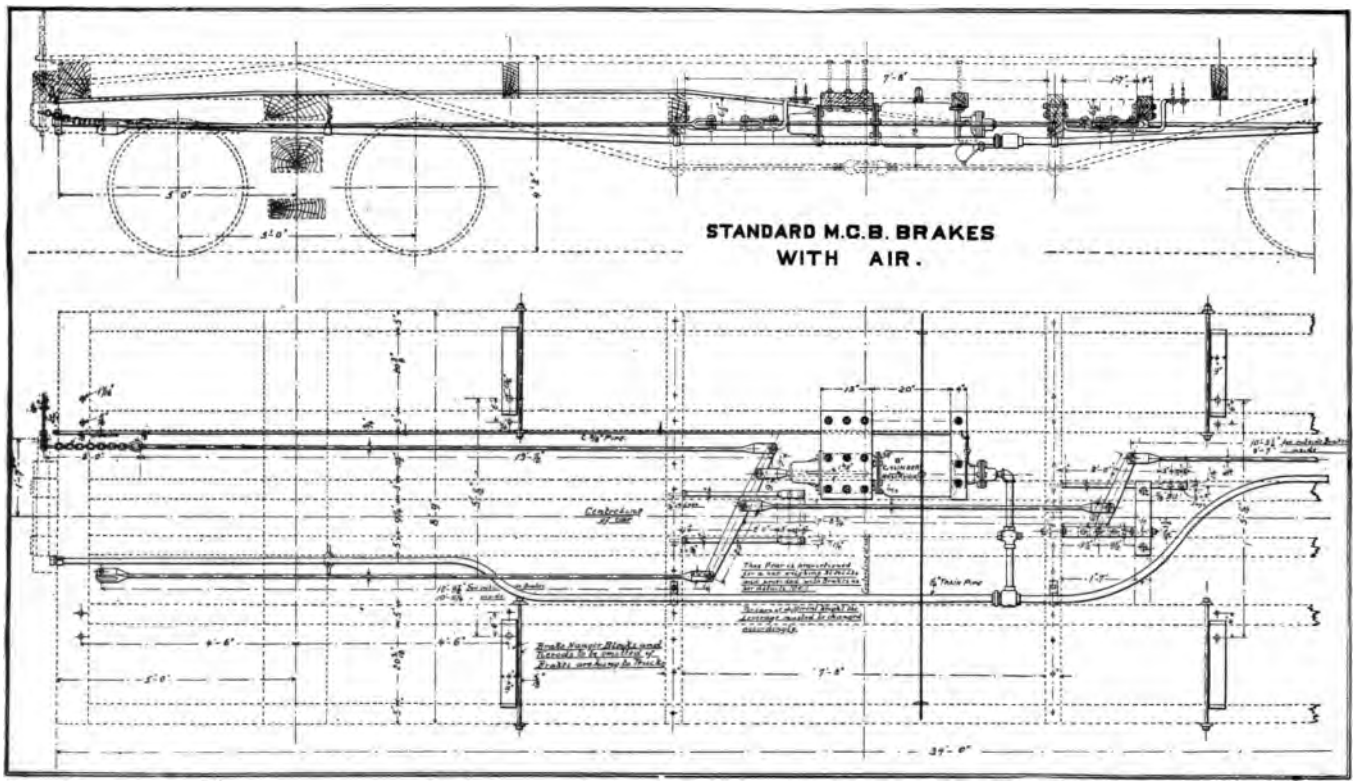
SUMMARY—BRAKES HUNG FROM TRUCKS.

MATERIALS.	Price.	Shaft and Fittings.	Hangers, Etc.	M. C. B. Body Part.	M. C. B. Truck Part.	Cylinder, Pipes, Etc.	Wood Plated Beams.	End Brake Platform.	Stiffners on Center Sills.	Metal Beams.
SHAFT AND FITTINGS.										
32 lbs castings										
22 " wrought iron										
1/4 " square nuts										
1/8 " wrought washers										
1 cotter										
HANGERS, ETC.										
148 lbs castings										
194 " wrought iron										
3 1/4 " square nuts										
4 " wrought washers										
8 split keys										
M. C. B. BODY PART.										
4 feet oak										
241 lbs wrought iron										
3/4 " square nuts										
3/8 " wrought washers										
8 cotters										
1 brake chain										
M. C. B. TRUCK PART.										
230 lbs wrought iron										
3/4 " square nuts										
1/4 " wrought washers										
12 cotters										
CYLINDER, PIPES, ETC.										
11 feet oak										
56 lbs wrought iron										
1 3/4 " square nuts										
1 1/4 " wrought washers										
1 cotter										
1 set air-brakes										
Pipes and fittings										
6 pipe staples										
4 screws										
WOOD PLATED BEAMS.										
59 feet oak or hickory										
152 lbs castings										
152 " wrought iron										
9 1/2 " square nuts										
1 3/8 " wrought washers										

SUMMARY—BRAKES HUNG FROM TRUCKS—(Continued.)

MATERIALS.	Price.	Shaft and Fittings.	Hangers, Etc.	M. C. B. Body Part.	M. C. B. Truck Part.	Cylinder, Pipes, Etc.	Wood Plated Beams.	End Brake Platform.	Stiffners on Center Sills.	Metal Beams.
END BRAKE PLATFORM.										
8 feet oak										
14 lbs wrought iron										
1 " square nuts										
¼ " wrought washers										
STIFFNERS ON CENTER SILLS.										
15 feet oak										
METAL BEAMS.										
4 metal beams										
N. B.—For Flat or Gondola, add:										
9 lbs wrought iron										
For Box or Stock, add:										
14 lbs castings										
30 " wrought iron										
For cars requiring hanger blocks with inside brakes, add:										
26 feet oak										
3 lbs castings										
11 " wrought iron										
1¼ " square nuts ⅝"										
LABOR.										
Lumber yard										
Mill										
Blacksmith										
Bolt room										
Iron machine										
Car builders										
Pipe fitters										
General labor										
" expense										
RECAPITULATION.										
Materials										
Labor										
General expense										


BODY BRAKES
Centre Line


STANDARD M.C.B. BRAKES
WITH AIR.

BRAKES HUNG FROM CAR BODY.

Complete bill of all materials necessary for the application of Brakes hung from Car Body, based on the use of M. C. B. standard sizes of levers and connections, and application to a straight bottom car of about 30,000 lbs. weight, of the following general dimensions:

Length over end sill	34′ 0″
Outside end sill to center of bolster	5 0
Center to center of cross tie	8 0
Wheel base	5 0

See illustration, pages 176 and 177.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
	When Air is applied only.				
1	Cylinder block	Oak.	$3\frac{1}{2}$″x13″x1′ $10\frac{1}{2}$″	$3\frac{3}{4}$″x13$\frac{1}{4}$″x2′ 0″	8′
1	Reservoir block	"	$3\frac{1}{2}$ x 4 x1 $10\frac{1}{2}$	$3\frac{3}{4}$ x 4$\frac{1}{4}$ x2 0	3
					11′
	When Air is applied and Cars have Center Sill Stiffners only.				
1	Intermediate sill furring	Oak.	4″x5″x7′ 8″	4$\frac{1}{4}$″x5$\frac{1}{4}$″x8′ 0″	15′
	When Wood Beams are used only.				
4	Beams	Oak or Hk'ry	4″x7″x5′ 7″	4$\frac{1}{4}$″x7$\frac{1}{4}$″x5′ 9″	59′
	When Platform is used on End of Car only.				
1	Platform	Oak.	1$\frac{3}{4}$″x8$\frac{3}{4}$″x3′ 0″	2″x9″x3′ 0″	5′
1	Platform bracket furring	"	3 x4	3$\frac{1}{4}$ x4$\frac{1}{4}$ x3 0	3
					8′
4	Hanger blocks	Oak.	4″ x9″ x1′ 10$\frac{3}{8}$″	4$\frac{1}{4}$″ x9$\frac{1}{4}$″ x2′ 0″	26′
1	Floating lever fulcrum bl'ck	"	4 x6 x1 7$\frac{1}{4}$	4$\frac{1}{4}$ x6$\frac{1}{4}$ x1 9	4
					30′

RECAPITULATION.

For double brakes without air, metal beams	30′
" " " " " wood "	89
" " " with " metal "	41
" " " " " wood "	100
" " " " " (for car with sill stiffners), add	15
" application of end platform to either, add	8

BRAKES HUNG FROM BODY—(Continued.)

CASTINGS.

Pcs.	Pattern.	Description.	Material.	Wt.
1		Wheel	Gray Iron	19
1		Ratchet wheel	" "	7
1		" " pawl	" "	3
1		Shaft guide at end sill	" "	3
8		Shoes (M. C. B. Christie)	" "	148
8		Plain washers for $\frac{5}{8}$" bolt	" "	3
8		Cup washers for 1" bolt	" "	16
				199
		For cars with wood plated beams only:		
8		Heads	Gray Iron	152
		For box or stock car add to the above:		
1		Shaft guide at girth	" "	3
1		" " roof	" "	11
				14

RECAPITULATION.

For double brakes, metal beams	199
" " " plated wood beams	351
" box or stock car add to either	14

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			1	Brake shaft drum	$1\frac{1}{2}$"x 1' 3"	7
Cot.	1	1	1	" " (end $\frac{3}{4}$" threaded)	$1\frac{1}{4}$ x 3 0	12
			1	" " key	$\frac{3}{8}$ x$\frac{3}{8}$x0 $2\frac{1}{2}$	1
				(Shaft is supported by extended carry iron.)		20
			1	For coal or flat car, add	4 "x $\frac{1}{2}$"x1' 0"	7
			1	" box or stock car, add	$1\frac{1}{4}$ x 6 9	27
			8	Hangers } Loop	$\frac{7}{8}$ x 2 2	35
			8	$20\frac{1}{2}$" inside, } Shank	1 x 1 5	30
Cup.	1	1	8	Hanger eyebolt, $10\frac{7}{8}$" under eye	1 x 1 7	33
	1	1	8	Safety hangers, } Hook-bolt	$\frac{5}{8}$ x 0 9	6
			8	$21\frac{3}{4}$" } Links	$\frac{1}{2}$ x 2 $\frac{1}{2}$	11
			8	Inside, } Hangers	$\frac{5}{8}$ x 1 $5\frac{1}{2}$	8
	2	1	8	Safety hanger eyebolt, 9" under eye	$\frac{5}{8}$ x 1 2	9
						132

(Continued.)

FORGINGS—(Continued.)

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			1	Cylinder lever, 20", 9" and 7" centers..	3½"x1 "x 2′ 11 "	34
			1	Floating lever, 6½" and 14½" centers ...	3½ x1 x 1 10	21
			3	Lever guides.....	1 x 3 7	28
			1	Floating lever fulcrum.....	2½ x ½ x 2 4¼	10
			1	" " " bracket.....	2½ x ½ x 1 0	4
			1	Hand connection, 13′ ½" from center to inside hook — rod....	⅝ x 13 ½	20
			2	center to inside hook — jaws...	2½ x ⅝ x 9	9
			1	Upper lever connection — rod....	⅝ x 11 7½	18
			4	12′ 9½" center, brake end — jaws..	2½ x ⅝ x 9	19
			1	Upper lever connection — rod....	⅝ x 9 3¼	14
			4	10′ 5¼" center, opp. end — jaws..	2½ x ⅝ x 9	19
			1	Cylinder connection — rod...	⅝ x 6 6⅝	10
			4	7′ 8¾" centers — jaws..	2½ x ⅝ x 9	19
		2		Chain, eyebolt and link. (See miscls.) (See Shoe Keys below.)		225
			2	Live levers, 8" and 24" centers.....	4 "x1 "x 2′ 6 "	67
			2	Dead levers, 7" and 21" centers.....	4 x1 x 2 2	58
			2	Lower connections — rod....	⅝ x 6 ½	18
			8	7′ 2½" centers — jaws...	2½ x ⅝ x 9	38
			2	Dead lever connections — rod.....	⅝ x 2 4	7
			4	3′ 3¼" from center to inside of eye — jaws....	2½ x ½ x 1 6	25
			2		⅞ x 2 1	8
			8	Shoe keys.....	⅞ x ½ x 10	10
			1	Push rod — rod ...	1⅜"x " 1′ 8½"	231
			2	27½" from center to end — jaws...	2½ x ⅝ 10½	8
			1	Release valve rod.....	⅜ x 5 6	11
			1	" " "	⅜ x 3 6	2
			2	" " " guides.....	1 x ¼ x 0 6	1
			2	Pipe clamps, end sill.....	1½ x ½ x 6½	1
			2	" " " "	1½ x ⅝ x 8½	3
			2	" " bolster.....	1½ x ⅝ x 1 2	3
			2	" " cross ties.....	1½ x ⅝ x 0 8	4
			2	Dummy coupler brackets	1½ x ⅝ x 0 6	3
			2	" " " link.....	⅝ x 1 0	2
				(Attached by carry iron bolt.)		1
						39
		2	4	Beam fulcrums, 1" shank	[2](2½"x ¾"x 0′ 11")	46
			4	" " washers.....	3 x ¼ x 0 3	3
			4	" plates.....	4 x ¼ x 5 6⅝	74
			8	" guides.....	⅞ x 10½	14
						137
				Platform brackets :		
			2	Brackets.....	1¼ x ⅝ x 2 6	11

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Brake shaft guides, lag	½"x 4¾"	1
	1		1	" " pawl, "	⅝ x 8	1
						2
				For Flat or Gondola Car, add:		
	1	1	2	Brake shaft bracket to end sill	⅝"x 1′ 1⅜"	2
				For Box or Stock Car, add:		
			2	Center guide to end girth, lag	½"x 4¾"	1
			1	Top " " roof, "	⅝ x 6½	1
	1	1	2	" " " "	⅝ x 6¾	1
						3
2		2	4	Hanger block tie rods	⅝"x 2′ 8⅞"	11
			12	Lever guides to sills, lag	½"x 4¾"	3
	2	1	2	Floating lever fulcrum block to sill	⅝ x 1′ 4⅞	3
	1	1	4	" " " to crosstie & blk	½ x 6½	1
			2	" " " rivets	¾ x 4	1
	Cot.		8	Connection pins	1⅛ x 4½	10
						18
	Cot		10	Connection pins	1⅛"x 4½"	13
	2	1	4	Cylinder and reservoir block to sill	⅝"x 1′ 1¾"	5
	1	1	4	" " " " " "	⅝ x 1 2⅜	5
	1	1	4	" " " to block	⅝ x 6¾	2
			14	Pipe clamps, lag	½ x 4¾	3
	Cot.		1	Connection pin	1⅛ x 4½	1
						16
	1	1	16	Plates to beams, C. B.	½"x 5½"	5
	1	2	8	Heads " "	¾ x 10⅛	10
						15
		1	4	Platform and bracket, C. B.	½"x 3½"	1
		2	2	Bracket to car, lag	½ x 4¾	1
		1	2	" " " C. B.	½ x 5⅞	1
	2	2		Change pawl lag to bolt if this step is used.		3

BRAKES HUNG FROM BODY—(Continued.)

RECAPITULATION.

C. W.	W. W.	Nuts.	Pcs.	Description.		Wt.
				For shaft and fittings.....	Forgings.	20
					Bolts	2
						22
				For hangers and safety chain ..	Forgings.	132
					Bolts	11
						143
				For M. C. B. std. form double brakes, body.....	Forgings.	225
					Bolts	18
						243
				For M. C. B. std. form double brakes, truck.....	Forgings.	231
					Bolts	13
						244
				For application of air.....	Forgings.	39
					Bolts	16
						55
				For wood "plated" beams	Forgings.	137
					Bolts	15
						152
				For end platform.....	Forgings.	11
					Bolts	3
						14
				If applied to flat or gondola car, add.....	Forgings.	7
					Bolts	2
						9
				If applied to box or stock car, add.	Forgings.	27
					Bolts	3
						30
				Total of above for flat or gondola car.....		882
				Total of above for box or stock car.....		903

BRAKES HUNG FROM BODY.—(Continued.)

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Weight.
	For Shaft and Fittings.		
1	U. S. standard square nut	For 3/4" bolt.	1/4
1	Wrought washer	" 3/4 "	1/8
1	Spring cotter for brake shaft	1/4" x 2"	
	Hangers and Safety Chain.		
24	U. S. standard square nuts	For 5/8" bolt.	3 1/2
8	" " " "	" 1 "	4 1/4
24	Wrought washers	" 5/8 "	1 7/8
8	" "	" 1 "	1 1/4
	M.C.B. Form of Double Brake, Body		
6	U. S. standard square nuts	For 1/2" bolt.	1/2
2	" " " "	" 5/8 "	1/4
4	Wrought washers	" 1/2 "	1/8
4	" "	" 5/8 "	1/4
8	Spring cotters for connection pins	3/8" x 2 1/4"	
1	Chain, eyebolt and link complete	3/8 x 24	
	M.C.B. Form Double Brake, Truck		
2	U. S. standard square nuts	For 7/8" bolt.	3/4
4	Wrought washers	" 7/8 "	1/2
10	Spring cotters for connection pins	3/8" x 2 1/4"	
	For Application of Air.		
12	U. S. standard square nuts	For 5/8" bolt.	1 3/4
16	Wrought washers	" 5/8 "	1 1/4
1	Spring cotter for connection pin	3/8" x 2 1/4"	
1 set.	Automatic brakes complete		
38 feet.	Train pipe	1 1/4" diameter.	
20 "	Retaining pipe (add 10' for box or stock car)	3/8" diameter.	
1	Pipe nipple	1 " x 6 "	
1	Reducing ell	1 x 1 1/4	
1	Straight "	1 1/4 x 1 1/4	
1	" "	3/8 x 3/8	
1	Union	3/8	
6	Retaining pipe staples		
4	Screws for release rod guides	1 1/2", No. 14.	

(Continued.)

MISCELLANEOUS MATERIALS—(Continued.)

Per Car	Description.	Size.	Wt.
	For Wood Plated Beams:		
16	U. S. Standard square nuts	For ½" Bolt	1¼
16	" " " "	" ⅝ "	4
8	" " " "	" 1 "	4¼
16	Wrought washers	" ½ "	⅝
8	" "	" ⅝ "	⅝
	For End Platform:		
6	U. S. Standard square nuts	For ½" Bolt	½
2	" " " "	" ⅝ "	½
2	Wrought washers	" ⅝ "	¼

RECAPITULATION.

U. S. Standard Square Nuts:	½"	⅝"	¾"	⅞"	1"	Total Wt.
Shaft and fittings			1			¼
Hangers and safety chain		24			8	7¾
M. C. B. form, body	6	2				¾
" " truck				2		¾
Application of air		12				1¾
Plated beams	16		16		8	9½
End platform	6		2			1
	28	38	19	2	16	21¾
Wrought Iron Washers:						
Shaft and fittings			1			⅛
Hangers and safety chain		24			8	3½
M. C. B. form, body	4	4				⅜
" " truck				4		½
Application of air		16				1½
Plated beams	16		8			1⅜
End platform			2			¼
	20	44	11	4	24	7⅛

19	Spring cotters for connections	⅜"x 2¼"
1	" " " brake shaft	¼ x 2
1	Brake chain	⅜ x24
1 set	Air brake equipment	Freight,
	Pipe and fittings	See details.
6	" staples	
4	Screws for release valve guides	1½" No. 14.

SUMMARY—BRAKES HUNG FROM CAR BODY.

MATERIALS.	Price.	Shaft and Fittings.	Hangers, Etc.	M. C. B. Body Part.	M. C. B. Truck Part	Cylinder, Pipes, Etc.	Wood Plated Beams.	End Brake Platform.	Stiffners on Center Sills	Metal Beams.
SHAFT AND FITTINGS.										
32 lbs castings										
22 " wrought iron										
¼ " square nuts										
⅛ " wrought washers										
1 cotter										
HANGERS, ETC.										
26 feet oak										
167 lbs castings										
143 " wrought iron										
7¾ " square nuts										
3¼ " wrought washers										
M. C. B. BODY PART										
4 feet oak										
243 lbs wrought iron										
¾ " square nuts										
⅜ " wrought washers										
8 cotters										
1 brake chain										
M. C. B. TRUCK PART.										
244 lbs wrought iron										
¾ " square nuts										
½ " wrought washers										
10 spring cotters										
CYLINDER, PIPES, ETC.										
11 feet oak										
55 lbs wrought iron										
1¾ " square nuts										
1¼ " wrought washers										
1 spring cotter										
1 set air-brakes										
6 pipe staples										
4 screws										
Pipe and fittings										
WOOD PLATED BEAMS.										
59 feet oak or hickory										
152 lbs castings										
152 " wrought iron										
9½ " square nuts										
1⅜ " wrought washers										

SUMMARY—BRAKES HUNG FROM CAR BODY—(Continued.)

MATERIALS.	Price.	Shaft and Fittings.	Hangers, Etc.	M. C. B. Body Part.	M. C. B. Truck Part.	Cylinder, Pipe, Etc.	Wood Plated Beams.	End Brake Platform.	Stiffners on Center Sills.	Metal Beams.
END BRAKE PLATFORM.										
8 feet oak										
14 lbs wrought iron										
1 " square nuts										
¼ " wrought washers										
STIFFNERS ON CENTER SILLS.										
15 feet oak										
METAL BEAMS.										
4 metal beams										
N. B.—For Box or Stock Car, add to above:										
14 lbs castings										
30 " wrought iron										
For Flat or Gondola, add:										
9 lbs wrought iron										
LABOR.										
Lumber yard										
Mill										
Blacksmith										
Bolt room										
Iron machine										
Car builders										
Pipe fitters										
General labor										
" expense										
RECAPITULATION.										
Materials										
Labor										
General expense										

CHAPTER VII.

ROOFS.

The varied conditions of service have caused great efforts to be made by the master car-builders and many leading manufacturers to construct a satisfactory, if not a perfect freight car roof, with the result that there are now in use a very large variety of designs. These may be divided into four distinct classes:

1st. The double board roofs.
2nd. The inside metal roofs.
3rd. The outside metal roofs.
4th. The plastic, paper, and composition roofs.

The application of the various freight car roofs often necessitates the changing of the quantity of materials that are not always considered as part of the roof equipment. To illustrate: Many of the roofs require two fascias, one of which is known as the fascia moulding, while other roofs require but a single fascia, thus affecting the quantity of fascia required.

All outside metal roofs require additional running boards over the side or end ladders, and are more expensive to properly secure to roof. If it is desired that the running board brackets be applied with bolts to outside metal roofs, it will be necessary to add gum washers.

With roofs requiring bottom courses running longitudinally, thus omitting ridge pole and purlines, fifteen carlines are to be included, while nine are considered sufficient with the other forms of application.

The application of any of the doors requiring a wooden hood also affects not only the fascia, but other materials as well. The materials furnished by the manufacturer for the various plastic and paper roofs are usually of such widths as to permit the application to any car having a door requiring an extension of the roof.

With the metal roofs, however, it is quite different, and

it is absolutely necessary for the estimator to advise the roof manufacturer that the roof is intended for cars having a door requiring the roof extension, and arrange to cover such other necessary materials as are affected thereby. It is suggested that such information be furnished the roof manufacturer whether it be for plastic, paper or metal roof.

It should be noted that all roofs permitting cheap grades of lumber like the Chicago, Hutchins, etc., have the roofing figured at 5′ 4″, while the double board is figured at 5′. In explanation of this will say that the cheaper grades of lumber are almost invariably bought in 16 feet lengths, which will make three pieces 5′ 4″ long.

Below are given such notes as are directly applicable to the various roofs presented.

Double Board Roof.—When this roof is applied, it is absolutely necessary that the very best grade of white pine be used for roofing boards.

Chicago Roof.—The illustration accompanying the bill of materials shows the latest improved design with metal sub-carlines which were formerly manufactured of wood.

It should be particularly noted that the bill of material for this roof includes wood screws for roof boards to side fascia and sub-purlines to carlines as shown in the illustration. Wire nails may be used instead of the wood screws if so desired.

Winslow Roof.—It should be noted in the bill of materials that provision is made for securing this roof with carriage bolts and lag screws. This is in accordance with the approved method, although it is sometimes applied with wood screws or barbed wire nails. This roof is also applied by a number of large railroad systems by fitting the sheets to the main carlines, thus increasing the number of the main carlines and omitting the sub-carlines and main purlines altogether.

The patent on this roof has expired and the sheets can be purchased from most any large manufacturer of galvanized iron.

The Excelsior Improved Inside Iron Roof and

Murphy's Improved Winslow Roof.—These are recent additions to this class of roofs and the illustrations together with the accompanying bills of materials show the basis of our figures.

Tin Roof.—This is the pioneer of the class of outside metal roofs. It should be noted from the bill of materials that 20"x28" tin is included, the substitution of any other size would make considerable difference in the qnantity of materials and labor of application.

Murphy's American Galvanized Roof and

Excelsior Outside Car Roof.—The construction and application of these roofs are clearly illustrated in the cuts accompanying the bills of materials. Particular attention is called to the method of securing the running boards.

Cabled Steel Roof.—The principal feature of this roof is the entire absence of nails, screws, rivets or bolts, penetrating the roof sheets, these as well as the main running boards being secured by galvanized wire cables, the ends of which are fastened inside the car to the plate, all as shown very clearly by the illustration.

A cable tightener is usually supplied by the Roof Company to the car-builders.

Anchor Iron Roof.—Drawings not being obtainable, a crude cut is presented which, together with the bill of materials, will convey sufficient information for comparison with other roofs.

Empire Iron Roof.—Since drawings were not obtainable, the accompanying bill of materials represent the application to cars last constructed under the supervision of the writer.

Hutchins Roofs.—The illustration accompanying bill of materials shows the application of this roof between two courses of boards without air space. However, it is some times applied with an air space similar to the Winslow type. The former method is more often used, therefore the comparison herein made is so based.

It should be noted that this roof is also applied in con-_ection with the Morris patent which does away with the carlines by making the lower course of roofing 3" thick and sawing so as to allow of 2" pitch on the roof. This design is usually applied to furniture cars and buggy cars where it is necessary to gain head room.

The Torsion, Columbia or Neponset Roof.—This is a new departure from the usual manner of applying felt or paper roofs, and is designed by F. W. Bird & Son for application of

either their Torsion, Columbia or Neponset brand of roofing. It should be noted that a ridge pole is shown in the illustration, which is not included in the bill of material, as patentee considers it unnecessary.

Drake & Wier's Roofs.—Two cuts are presented with the bill of materials, one of which shows the usual manner of application with air space, the other shows a new method of applying between two courses of boards without air space.

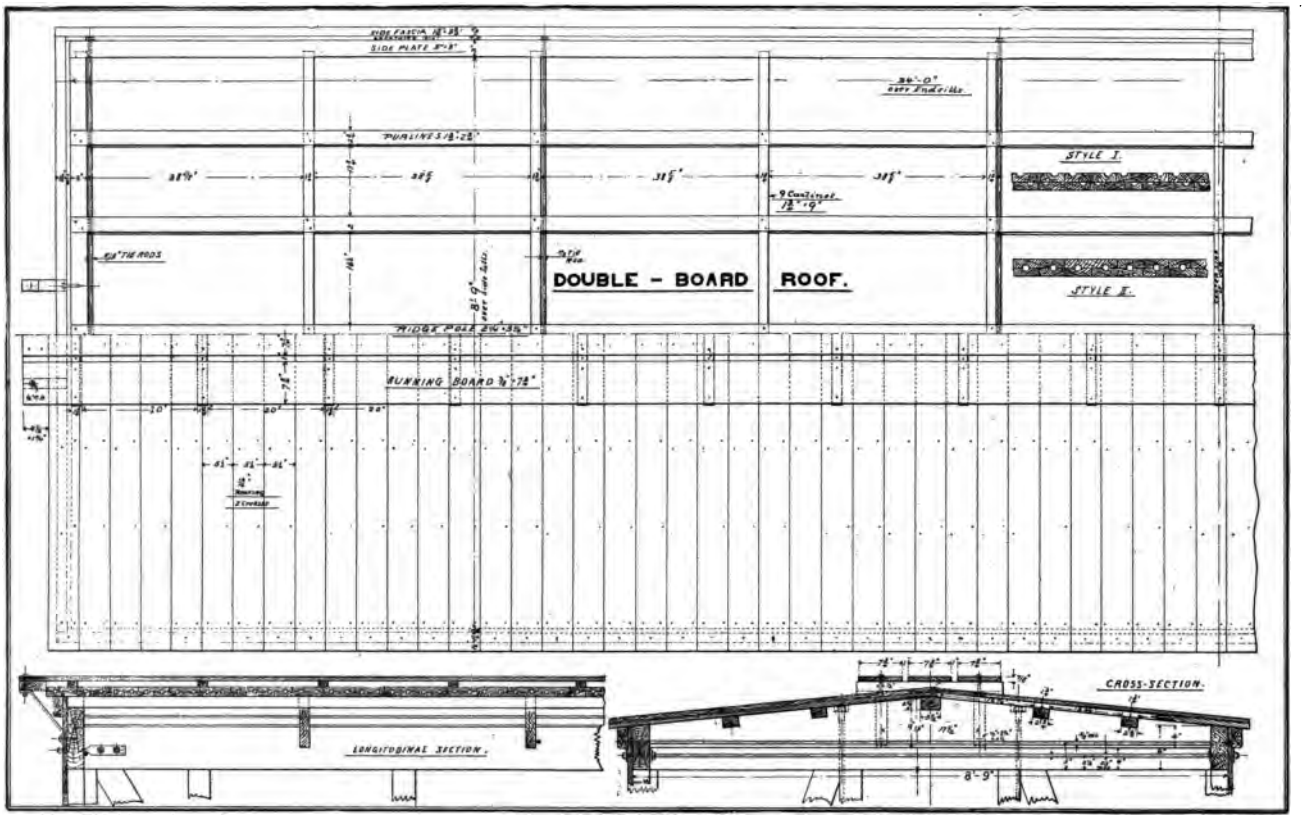
Fay Manilla Roof.—This roof is applied with an air space similar to the ordinary Winslow Roof.

LeGros Improved Roof.—This is a composition roof of an entirely different design from any previously mentioned, the principal features being the use of special roofing paint, roofing canvas, and metal gully covers applied as shown in cut presented with bill of materials.

Lumber used for roofing in the application of this roof must be poplar, white or yellow pine, sound, free from decay, large, loose or unsound knots, and thoroughly seasoned.

When this roof is applied credit should be given the car body for sufficient materials to paint the roof proper, as the roof materials furnished by the LeGros Company also include paint materials sufficient for the roof.

2½" No. 7 nails are specified for the lower roof to the purlines, oft times, however, the purlines are only 1¾" thick, which allows for 2½" nails to come through.


DOUBLE - BOARD ROOF.
STYLE I.
STYLE II.
RIDGE POLE 2¼"x8½"
RUNNING BOARD ⅞"x7½"
PURLINS 5"x8"-22"
SIDE PLATE 3"x8"
¾" TIE RODS
LONGITUDINAL SECTION.
CROSS-SECTION.

DOUBLE BOARD ROOF.

Complete Bill of all Materials Necessary for the Application of Double Board Roof to 34 ft. Car.

LUMBER.

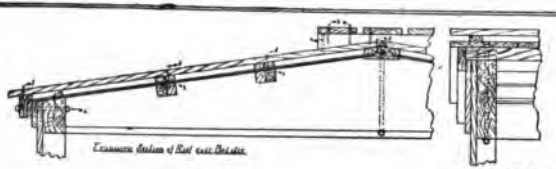
Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
9	Carlines	Oak	1¼"x 9 "x 8′ 5 "	2 "x9½"x 8′ 9"	122′
1	Ridge pole	Pine	2½ x 3½ x34 0	2½ x3¾ x34 6	27
4	Purlines	"	1¾ x 2¾ x34 0	2 x3 x34 6	69
2	Side fascia	"	1¾ x 8¾ x34 5⅛	2 x4 x35 0	47
4	End "	"	1¾ x 3¾ x 4 6	2 x4 x 5 0	13
304	Roofing	W. P.	13/16 x 5½ x 4 9	1 x6 x 5 0	760
3	Running boards	Pine	⅞ x 7¾ x sect'ns	1 x8 x36 0	72
19	Running bd. saddles	Oak		Cuttings.	
2	" " cleats	"	1¼ x 4½ x 1 11	2 x6 x 2 0	4
					1114

MISCELLANEOUS.

Per Car.	Description.	Size.	Wt.
12	Nails, purlines and ridge pole to plates	4 " No. 6, B. W.	½
90	" " " " " " carlines	3½ " 9, "	1½
189	" running boards	2 " 11, "	1¼
1368	" lower roofing	2 " 11, "	8⅝
1368	" upper "	3½ " 9, "	21½
76	" running board saddles	3½ " 9, "	1½
90	" fascia	40 d Cut.	6½
	Paint Materials.		41½

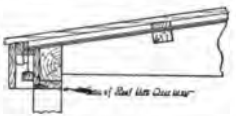
SUMMARY.

Quantity.		Specifications.	Price.	Amount.
126	feet.	Oak, carlines and running board cleats.		
96	"	Pine, ridge pole and purlines		
60	"	" fascia		
760	"	White pine roofing		
72	"	Pine running boards		
1114				
760	feet.	Kiln drying		
6½	lbs.	Cut nails		
34¾	"	B. W. nails		
		Paint material		
		Labor:		
		Lumber yard		
		Mill		
		Car builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

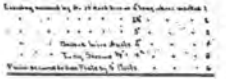


Transverse Section of Roof over Car Letter

Side View End Plate



Section of Roof over Door Opening



Showing increase in No. of Bows from one Car Length to another

		15	1
		5'	2
	Distance between Bows	6'	3
	Total Distance No.	90'	4
		6	5

Number recommended by Chicago Car Roofing Co. Patents & Plates

CHICAGO CAR ROOFING COMPANY

CORRUGATED · CORNERED · IRON · SECTIONAL · CAR ROOFING

OFFICE 730 & 739 Old Colony Bldg.

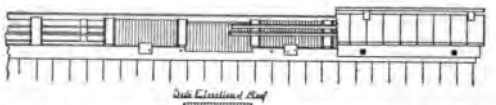
CHICAGO

Manufacturers of Every Style

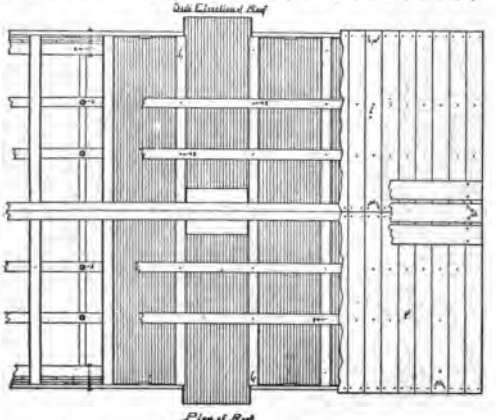
Iron Car Roofing over 40 yrs use.

DRAWINGS of CHICAGO ROOF

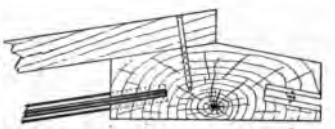
PAT'D 1882



Side Elevation of Roof

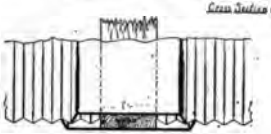


Plan of Roof

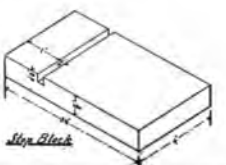


Cross Section of Ridge Pole

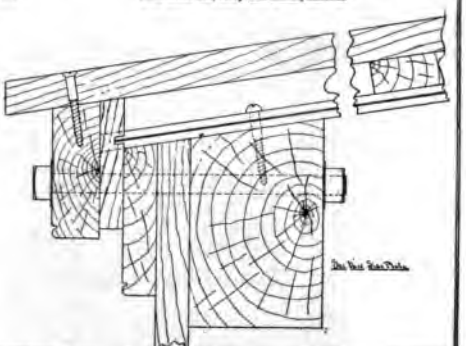
Side Elevation of Ridge Pole showing Section



Cross Section of Eave Gutter



Step Block



Iron Eave Gutter Plate

THE IMPROVED CHICAGO GALVANIZED IRON ROOF.

Complete Bill of all Materials Necessary for the Application of the Improved Chicago Galvanized Iron Roof to 34 ft. Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
9	Carlines	Oak	1¾"x 9"x 8′ 5"	2"x 9½"x 8′ 9"	122′
1	Ridge pole	Pine	2 x 5½ x 34 0	2¼ x 5¾ x 34 6	37
4	Purlines	"	1¾ x 2⅝ x 34 0	2 x 3 x 34 6	69
40	Sub-carlines	"	⅝ x 1½ x 4 6	1 x 2 x 5 0	33
4	" purlines	"	⅞ x 2⅝ sect'ns.	1 x 3 x 36 0	36
2	" fascia	"	13/16 x 3¾ "	1 x 4 x 35 0	23
2	Side fascia	"	1½ x 3¾ "	1½ x 4 x 35 0	35
2	End "	"	13/16 x 11½ x	1 x 12 x 9 0	18
4	" "	"	1½ x 3¾ x 4 8½	1½ x 4 x 5 0	10
160	Roofing	"	13/16 x 5½	1 x 6 x 5 4	427
3	Running boards	"	⅞ x 7⅝ sect'ns.	1 x 8 x 36 0	72
2	Run'g bd. cleats	Oak	1¾ x 4½ x 1 11	2 x 6 x 2 0	4
19	" " saddles	"	1¾ x	Cuttings	
38	Roof stop blocks	"	⅝ x 4 x 0 3½	"	
					886′

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	2	1	2	Ridge pole and plate	½" x 1′ 3 "	2
	2	1	9	" " " carlines	½ x 0 11	5
	2	1	24	Fascia and plate	½ x 0 8½	11
	1		44	Purline, plate and carlines, lag	⅝ x 0 4½	6
						24

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
40	Round head iron wood screws, sub-carlines and side plate	2 " No. 14	
	Flat Head Iron Wood Screws.		
320	Roof boards and side fascia	2 No. 14	
160	Sub-purlines and carlines	3 No. 14	
38	Running board saddles	3 No. 14	
518			
	Nails:		
189	Running boards and saddles	2 " No. 11, B.W.	1¼
38	" " saddles	3½ No. 9, "	¾
640	Roofing to sub-purlines and ridge pole	1¾ No. 9. "	5½
76	Roof stop blocks	5 d cut.	½
90	Fascia to plate	3½ No. 9 B.W.	1½
			9½
35	U. S. standard square nuts	For ½" bolt.	3
44	Wrought washers	" ⅝ "	1
70	" "	" ½ "	3
	Paint materials		4
	Galvanized Iron Materials complete for Chicago Roof for 34′ car, including roof sheets and metal sub-carlines, as per patent 1892. All as furnished by the Chicago Car Roofing Co., Chicago, Ill.		

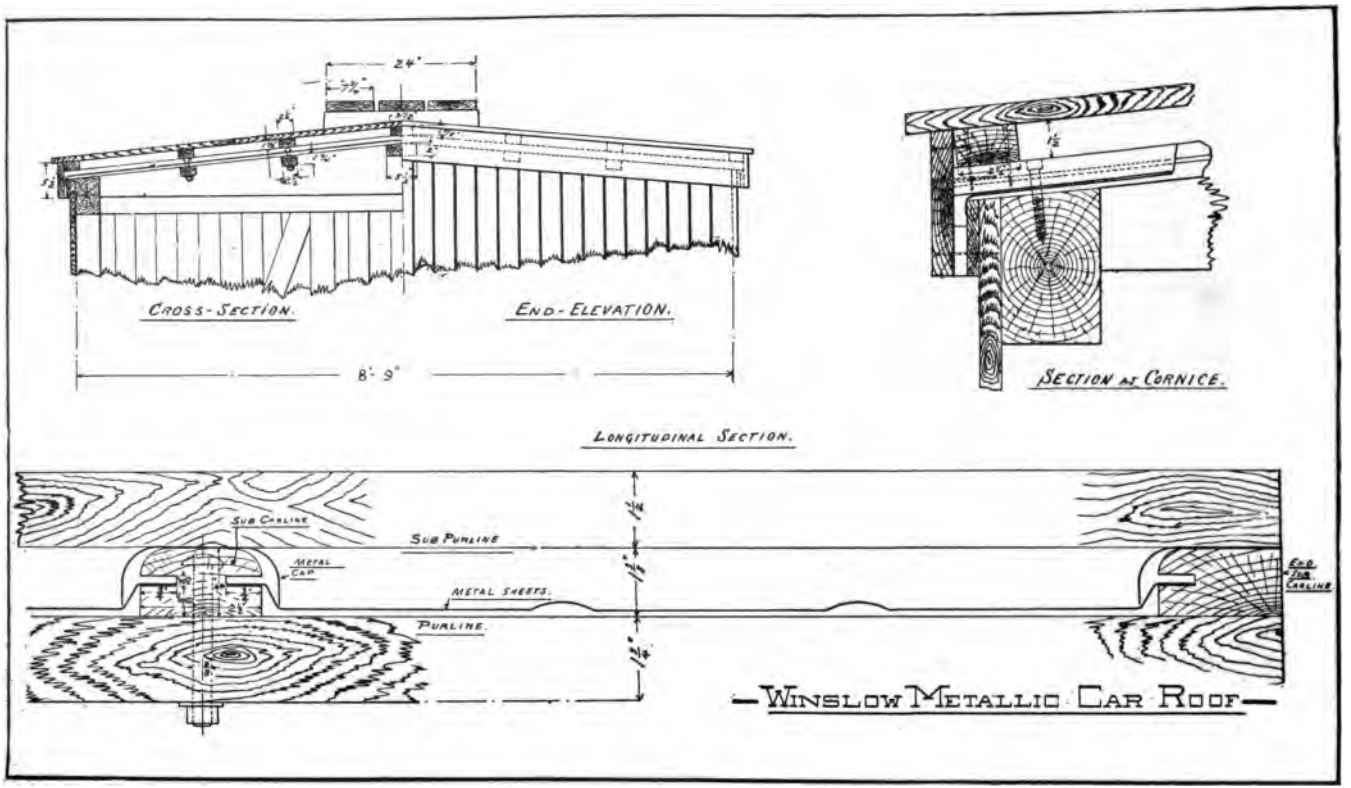
CHICAGO GALVANIZED IRON ROOF.—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
126	feet.	Lumber, oak, carlines and running bd. cleats			
106	"	Pine, ridge pole and purlines			
33	"	" sub-carlines			
36	"	" sub-purlines			
86	"	" side and end fascia....			
427	"	" roofing.			
72	"	" running b'ds			
886	"				
513	feet.	Kiln drying			
24	lbs.	Wrought iron.....			
3	"	Nuts.			
4	"	Washers.			
9	"	B. W. Nails			
½	"	Cut "			
518		Wood screws, flat head....			
40		" " round heed..			
		Paint materials.			
1	car.	Chicago roof complete.....			
		Labor:			
		Lumber yard.....			
		Mill			
		Car builder.			
		Bolt room.....			
		Painter.			
		General labor.....			
		General expense.....			

RECAPITULATION.

Materials		
Labor.....		
General expense		


24"
CROSS-SECTION.
END-ELEVATION.
8'-9"
SECTION AT CORNICE.
LONGITUDINAL SECTION.
SUB CARLINE
SUB PURLINE
METAL CAP
METAL SHEETS.
PURLINE.
FOR SUB CARLINE
WINSLOW METALLIC CAR ROOF

WINSLOW IRON ROOF.

Complete Bill of all Materials Necessary for the Application of the Winslow Iron Roof to 34 Foot Car.

LUMBER.

Pcs.	Description.	Mat'l	Finished Size.	Rough Size.	B. M.
9	Carlines	Oak.	1¾ " x9 "x 8′ 5"	2 "x9¼"x 8′ 9"	122′
1	Ridge pole	Pine.	2 x5½ x34 0	2¼ x5¾ x34 6	37
4	Purlines	"	1¾ x2½ x34 0	2 x2¾ x34 6	63
38	Sub-carlines	"	1⅜ x2½	1¾ x2¾ x 5 0	76
4	"	"	1⅜ x2⅞	1¾ x3¼ x 5 0	10
6	Sub-purlines	"	1½ x2½ x34 0	1¾ x2¾ x34 6	83
1	" ridge pole	"	1⅝ x3½ x34 0	2 x3¾ x34 6	22
2	Side fascia	"	⅞ x5½ x sc'ns	1 x6 x36 0	36
4	End "	"	⅞ x5½	1 x6 x 5 0	10
160	Roofing	"	13/16 x5¼	1 x6 x 5 4	427
2	Sub-fascia	"	⅞ x2½	1 x3 x36 0	18
42	Fascia blocks			Cuttings.	.....
3	Running boards	"	⅞ x7¾ x sc'ns	1 x8 x36 0	72
19	" " saddles	Oak.		Cuttings.	.....
2	" " cleats	"	1¾ x4½ x 1 11	2 x6 x 2 0	4
					980′

BOLTS.

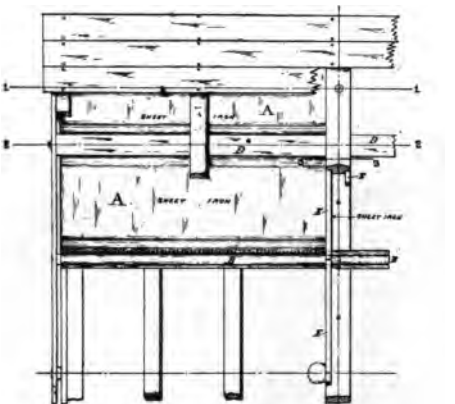
C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank	Wt.
	1	1	76	Sub-carlines to purlines, C. B	⅜" x0′ 4 " ..	9
	1		50	Sub-carlines to plates, lag	⅜ x0 4 ..	6
	1		42	" " ridge pole, lag	⅜ x0 3½ ..	4
	1		11	Sub-ridge pole to carlines and end plate, lag	⅜ x0 7 ..	2
						21

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	Galvanized iron materials complete for Winslow roof for 34′ car, including roof sheets and sub-carline caps		
	Nails:		
12	Ridge pole and purlines to end plate	4 " No. 6, B.W.	½
90	" " " " " carlines	3¼ " 9, "	1½
252	Sub-purlines to sub-carlines	2½ " 6, "	5
180	Fascia	3¼ " 9, "	3
90	" moulding	2 " 11, "	¾
84	Fascia blocks	5 d cut,	½
1368	Roof to sub-purlines	2 No. 11, B.W.	8¾
76	Running board saddles	3¼ " 9, "	1¼
189	" "	2 " 11, "	1¼
			22½
76	U. S. Standard square nuts	For ⅜" bolt	3
179	Wrought washers	" ⅜ "	3
	Paint materials		.....

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
126	feet.	Lumber, oak, carlines, etc...			
205	"	pine, ridge pole and purlines.....			
86	"	" sub-carlines...			
64	"	" fascia			
427	"	" roofing.....			
72	"	" running boards			
980	"				
491	feet.	Kiln drying			
21	lbs.	Wrought iron			
½	"	Nails, cut			
22½	"	" B. W			
3	"	Nuts.....			
3	"	Wrought washers.....			
		Winslow roof materials complete.....			
		Paint materials.....			
		Labor:			
		Lumber yard.....			
		Mill			
		Bolt room.....			
		Car builders.....			
		Painters			
		General labor.....			
		" expense			
		RECAPITULATION.			
		Materials.....			
		Labor.....			
		General expense.....			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THE IMPROVED INSIDE IRON ROOF.

Complete Bill of All Materials Necessary for the Application of the Improved Inside Iron Roof to 34-Ft. Car.

LUMBER.

Pcs	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
9	Carlines	Oak	1¾"x9 "x8 ' 5 "	2 "x 9¼"x8'9"	122
1	Ridge pole	Pine	1¾ x4 x34 0	2 x 4¼x34 6	25
4	Purlines	"	1¾ x2¾x34 0	2 x 3 x34 6	69
38	Sub-carlines, bottom	"	⅞ x1¾x4 7	1 x 2 x5 0	32
4	" " "	"	⅞ x1 x4 7	1 x 1¼x5 0	2
1	" ridge pole	"	2½ x4 x34 0	2¾x 4¼x34 6	34
	" " " furring	"	11/16 x1	1 x 1¼x68lin	7
38	" carlines, top	"	⅞ x3¾x4 7	1 x 4 x5 0	64
4	" " "	"	⅞ x1¾x4 7	1 x 2 x5 0	3
4	Sub-purlines	"	1½ x2¾x34 0	1¾x 3 x34 6	60
160	Roofing	"	13/16 x5¼	1 x 6 x5 4	427
42	Fascia blocks	"	⅝ x3 x0 2¾	Cuttings	
2	" side	"	⅞ x5¾ Sections	1 x 6 x36 0	36
2	" end	"	⅞ x11	1 x12 x9 0	18
19	Running board saddles	Oak	To fit	Cuttings	
2	" " cleats	"	1¾ x4½x1' 11"	2 x 6 x2 0	4
3	" boards	Pine	⅞ x7¾ Sections	1 x 8 x36 0	72
					975

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
1		1	8	Sub-ridge pole to main ridge pole, C. H.	½"x 5⅝"	3
1		1	42	Fascia to side plate, B. H.	½ x 6¼	14
						17

MISCELLANEOUS MATERIALS.

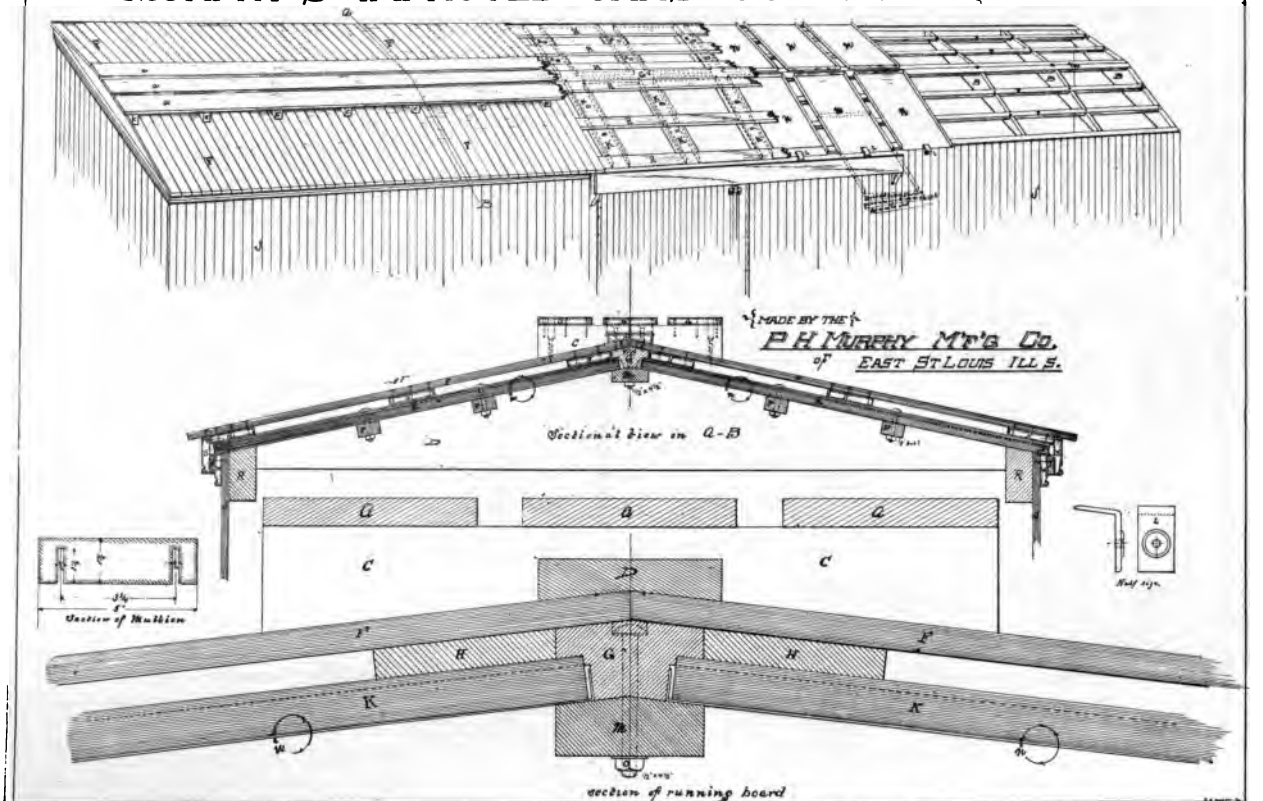
Per Car	Description.	Size.	Wt.
	The improved inside iron roof materials, complete for 34 ft. car, all as furnished by the Excelsior Car Roof Company, St. Louis, Mo.		
	Nails:		
12	Purline and ridge pole to end plate	4 " No. 6 B.W.	½
90	" " " " carlines	3¼ " 9 "	1½
189	Running boards to saddles	2 " 11 "	1¼
76	" " saddles to roof	3¼ " 9 "	1¼
70	Sub-ridge pole furring	1¾ " 9 "	¾
960	Roof to sub-purlines and ridge pole	1¾ " 9 "	8¼
20	End fascia to plate	3¼ " 9 "	½
84	Blocks to siding	5 d Cut.	½
168	Sub-carlines to purlines	3¼ " 9 B.W.	2¾
168	" purlines to sub-carlines	2¼ " 9 "	2
			19¼
50	U. S. standard square nuts	For ½" bolt	4
50	Wrought washers	" ½ "	2
84	Flat head iron wood screws, sub-carlines and side plates	3" No. 16	
	Paint materials		

THE IMPROVED INSIDE IRON ROOF—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am'nt
126	feet.	Lumber, oak, carlines and running bd. cleats..		
188	"	pine, ridge pole and purlines.....		
108	"	" sub-carlines		
427	"	" roofing		
54	"	" fascia.....		
72	"	" running boards.		
975	"			
481	feet.	Kiln drying.....		
		Imp'd inside iron roof materials		
17	lbs.	Wrought iron		
4	"	U. S. Standard square nuts....		
2	"	Wrought iron washers		
18¾	"	B. W. nails.....		
½	"	Cut "		
84		F. H. iron wood screws.....		
		Paint materials		
		Labor :		
		Lumber yard.....		
		Mill.....		
		Bolt room		
		Car builder.....		
		Painter.....		
		General labor		
		" expense.....		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense.....		

MURPHY'S IMPROVED WINSLOW CAR ROOF.



MURPHY'S IMPROVED WINSLOW CAR ROOF.

Complete Bill of All Materials Necessary for the Application of the Murphy Improved Winslow Roof to 34-foot Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
9	Carlines	Oak.	1¾"x 9 "x 8′ 5"	2 "x 9¼"x 8′ 9"	122′
1	Ridge pole	Pine.	2 x 5 x34 0	2¼ x 5¼ x34 6	34
4	Purlines	"	1¾ x 2¾ x34 0	2 x 3 x34 6	69
34	Sub-carlines	"	1½ x 5 x 4 6	1¾ x 5¼ x 4 9	124
6	Sub-purlines	"	⅞ x 5¾ x sec'ns	1 x 6 x36 0	108
1	Sub-ridge pole	"	2¾ x 5 x34 0	3 x 5¼ x34 6	45
160	Roofing	"	13/16x 5¼ x	1 x 6 x 5 4	427
2	Fascia, side mould'g	"	1¼ x 7 x sec'ns	1½ x 7¼ x36 0	65
	" blocks	"	⅝ x 3 x 0 3	Cuttings.	
2	" side	"	⅞ x 5½ x sec'ns	1 x 6 x36 0	36
2	" end	"	⅞ x11 x	1 x12 x 9 0	18
4	" end mould'g	"	1¼ x 7 x	1½ x 7¼ x 5 0	18
1	Roof cap	"	1½ x 5¾ x34 6	2 x 6 x35 0	35
19	Running b'ds, saddle	Oak	To suit.	Cuttings.	
2	" " cleats	"		2 x 6 x 2 0	4
3	Running boards	Pine.	⅞ x 7¾ x sec'ns	1 x 8 x36 0	72
					1177′

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	10	Sub-ridge pole to main ridge pole, C. B.	½"x0′ 5⅜"	3
	1	1	60	Sub-carlines to purlines, C. B.	⅜ x0 4¼	7
						10

MISCELLANEOUS MATERIALS.

Per Car	Description.	Size.	Wt.
	Murphy's Improved Winslow Car Roof, complete, including malleable iron sheet clips, for 34′ car, all as manufactured by P. H. Murphy M'f'g Co., East St. Louis, Ill.		
	Nails:		
12	Purlines and ridge pole to end plates	4 " No. 6 B. W.	½
90	" " " " " carlines	3¼ " 9 "	1½
189	Running boards to saddles	2 " 9 "	1¼
1600	Roofing	1¾ " 9 "	13½
90	Fascia to car	3¼ " 9 "	1½
90	Fascia moulding to car	4 " 6 "	3
204	Sub-purlines and sub-carlines	2 " 11 "	1½
70	Roof cap	3¼ " 9 "	1¼
			24
	Flat-Head Iron Wood Screws:		
38	Running board saddles to roof	3½" No. 18	
32	Sheet clips to plate	3 " 18	
70	(Continued.)		

MURPHY'S IMPROVED WINSLOW CAR ROOF.
(Continued.)

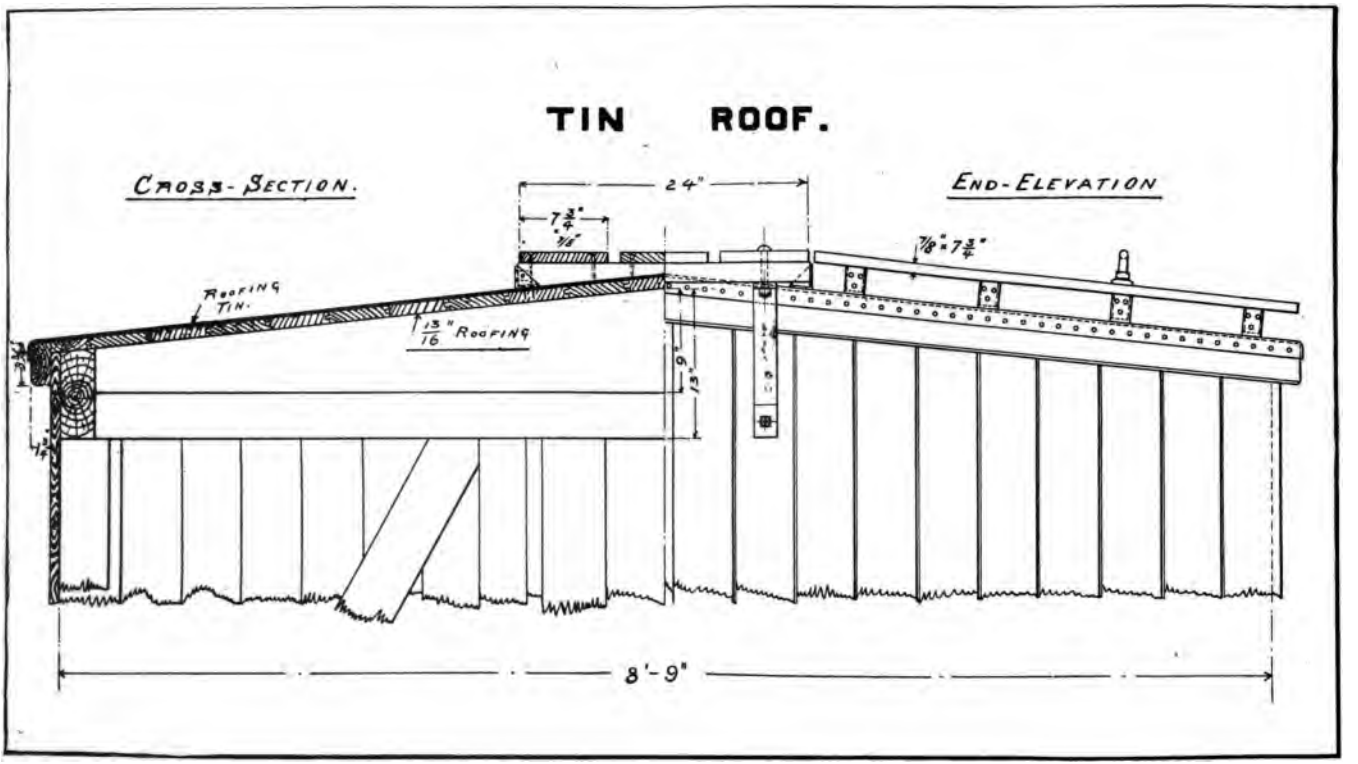
MISCELLANEOUS MATERIALS—(Continued.)

Per Car.	Description.	Size.	Wt.
10	U. S. standard square nuts	For ½" bolt.	1
60	" " " "	" ⅜ "	2
			3
10	Wrought washers	" ½ "	1
60	" "	" ⅜ "	1
			2
	Paint materials		

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
126	Feet.	Lumber, oak carlines, etc		
183	"	Pine ridge poles and purlines		
108	"	" sub-purlines		
124	"	" sub-carlines		
427	"	" roofing		
83	"	" fascia, 1¼"		
54	"	" " ⅞		
72	"	" running boards		
1177	"			
564	"	Kiln drying		
		Murphy's roof materials		
10	lbs.	Wrought iron		
24	"	B. W. Nails		
70		F. H. iron wood screws		
3	"	Nuts		
2	"	Washers		
		Paint materials		
		Labor:		
		Lumber yard		
		Mill		
		Bolt room		
		Car builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

TIN ROOF.


CROSS-SECTION.
24"
7 3/4"
3/16
END-ELEVATION
7/8" = 7 3/4"
ROOFING TIN.
13/16" ROOFING
9"
13"
8'-9"

TIN ROOF.

Complete Bill of Materials Necessary for the Application of Tin Roof to 34 Foot Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
15	Carlines	Oak.	1¾ "x9 "x 8′ 5 "	2"x9¼"x 8′ 9"	202′
22	Roofing	Pine.	13/16 x5¼ sections.	1 x6 x36 0	396
2	Side fascia	"	1¾ x3¾ x34 5⅛	2 x4 x35 0	47
4	End "	"	1¾ x3¾ x 4 6	2 x4 x 5 0	13
3	Running boards	"	⅞ x7¾ sections.	1 x8 x36 0	72
6	" " short.	"	⅞ x7¾	1 x8 x 4 0	16
27	" " cleats.	Oak.		Cuttings.	.....
2	" " ends.	"	1¾ x4½ x 1′11 "	2 x6 x 2 0	4
					750′

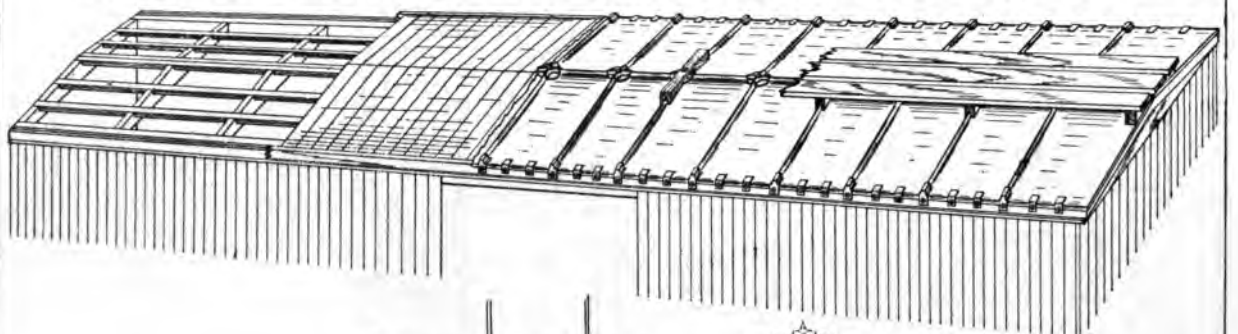
MISCELLANEOUS.

Per Car.	Description.	Size.	Wt.
897	Nails, roof carlines	2 " No. 11, B.W.	5¾
237	" running board	2 " 11, "	1½
90	" fascia	40 d, cut,	6½
3836	" tin to roof	¾ No. 12, B. W.	7
			20¾
95 sheets.	Tin 20"x28"		....
	Solder		14
	Paint Material.		

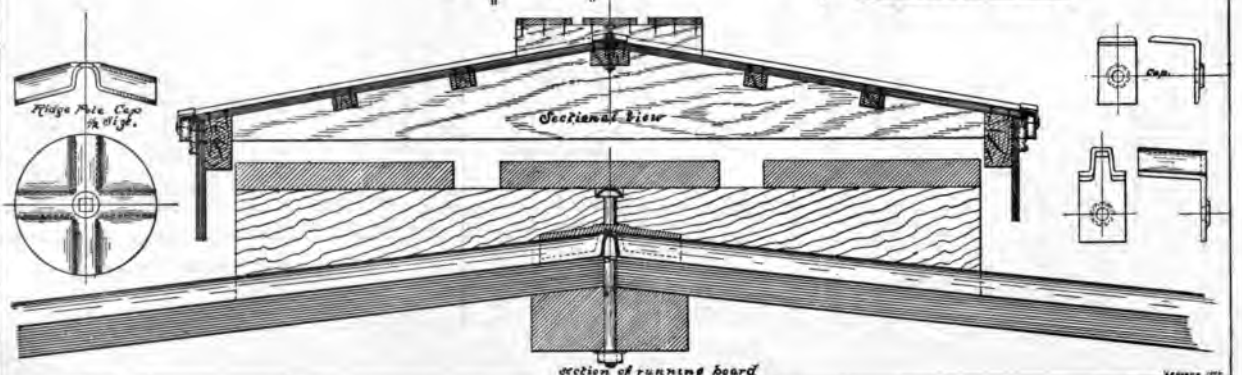
SUMMARY.

Quantity.		Specification.	Price.	Amount.
		Lumber:		
206	Feet.	Oak, carlines and running board cleats	.....	....
396	"	Cheap pine roofing	.....	....
88	"	Pine running boards	.....	....
60	"	" fascia	.....	....
750	"			
456	"	Kiln drying	.....	....
14¼	lbs.	B. W. nails	.....	....
6½	"	Cut "	.....	....
95	Sh'ets	Tin, 20"x28"	.....	....
14	lbs.	Solder	.....	....
		Paint materials	.....	....
		Labor:		
		Lumber yard	.....	....
		Mill	.....	....
		Car builders	.....	....
		Tinsmith	.....	....
		Painters	.....	....
		General labor	.....	....
		" expense	.....	....
		RECAPITULATION:		
		Material	.....	....
		Labor	.....	....
		General expense	.....	....

MURPHY'S AMERICAN GALVANIZED IRON CAR ROOF.



MADE BY THE
P. H. MURPHY M'f'g. Co.
of EAST ST. LOUIS ILL'S.



MURPHY'S AMERICAN GALVANIZED IRON CAR ROOF.

Complete Bill of all Materials Necessary for the Application of the Murphy American Galvanized Iron Roof to 34′ Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
9	Carlines	Oak	1¾″x 9 ″x 8′ 5″	2 ″x 9¼″x 8′ 9″	122′
1	Ridge pole	Pine	2½ x 5 x 34 0	2½ x 5¼ x 34 6	38
4	Purlines	"	1¾ x 2¾ x 34 0	2 x 3 x 34 6	69
2	Side fascia	"	⅞ x 3¾ x 34 3½	1 x 4 x 36 0	24
2	" " moulding	"	1¼ x 3¾ x 34 6	1½ x 4 x 35 0	35
2	End "	"	⅞ x 11½ x 8 10¾	1 x 12 x 9 0	18
4	" " moulding	"	1¼ x 3¾ x	1½ x 4 x 5 0	10
160	Roofing	"	⅞ x 5½ x	1 x 6 x 5 4	427
3	Running boards	"	⅞ x 7½ sections	1 x 8 x 36 0	72
8	Running bd. saddles	Oak	To suit	Cuttings	
2	" " cleats	"	1¾ x 4½ x 1 11	2 x 6 x 2 0	4
6	" " short	Pine	⅞ x 7¾ x	1 x 8 x 4 0	16
8	" " cleats,short	Oak		Cuttings	
					835

FORGINGS AND BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			4	Angles for short running boards	2″ x ¼″ x 0′ 10″	6
			4	" " " " "	2 x ¼ x 0 8	4
	1	1	4	" to side plate, B. H	½ x 0 7½	2
	2	1	6	Run. bd. saddles and ridge pole, B.H.	½ x 6½	2
	1	1	7	Ridge pole caps and ridge pole, "	½ x 5½	2
						16

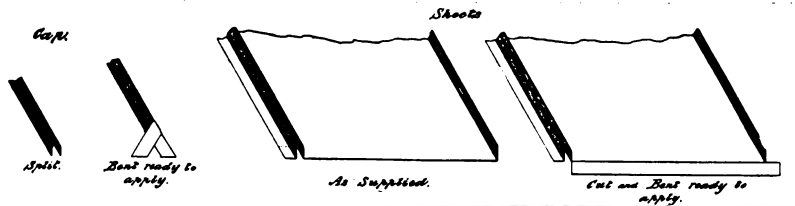
MISCELLANEOUS MATERIAL.

Per Car	Description.	Size.	Wt.
	The American Galvanized Iron Roof Materials complete, including caps for 34′ car, all as supplied by the P. H. Murphy Manufacturing Co., East St. Louis, Ill.		
2	Galvan'd iron for end run. bd. saddles	No. 20, 3″ x 6 ″	½
	Nails.		
12	Purlines and ridge pole to plates	4 " No. 6, B.W.	½
90	" " " " " carlines	3¼ No. 9, "	1½
90	Running boards, saddles and cleats	2 No. 11, "	2½
1440	Lower course roofing to plate purlines and ridge pole	2 No. 11, "	9½
72	Short running boards	2 No. 11, B.W.	½
360	Fascia to car	12 d cut.	8
	Flat head iron wood screws		20½
24	Short running board angles to car	1 " No. 16	
10	Galv. iron to fascia and run. bd. saddles	1½ No. 16	
82	Roof sheet angles to car	3 No. 18	
116			
17	U. S. standard square nuts	For ½" bolt	1
23	Wrought iron washers	" ½ "	1
	Paint materials		

MURPHY'S AMERICAN GALVANIZED CAR ROOF.
(Continued.)

SUMMARY.

Quantity.		Specifications.	Price	Am'nt.
		Lumber.		
126	feet.	oak, carlines, etc		
96	"	pine, purlines and ridge pole		
42	"	" 1" fascia		
46	"	" 1½" fascia moulding		
427	"	" roofing		
88	"	" running boards		
825	"			
515	feet.	Kiln drying		
15	lbs.	Wrought iron		
		American roof materials		
½	"	Galvanized iron		
1	"	Square nuts		
1	"	Wrought washers		
8	"	Nails, cut		
12½	"	" B. W		
116		F. H. iron wood screws		
		Paint materials		
		Labor.		
		Lumber yard		
		Mill		
		Blacksmith		
		Bolt room		
		Iron machine		
		Car builders		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		



THE

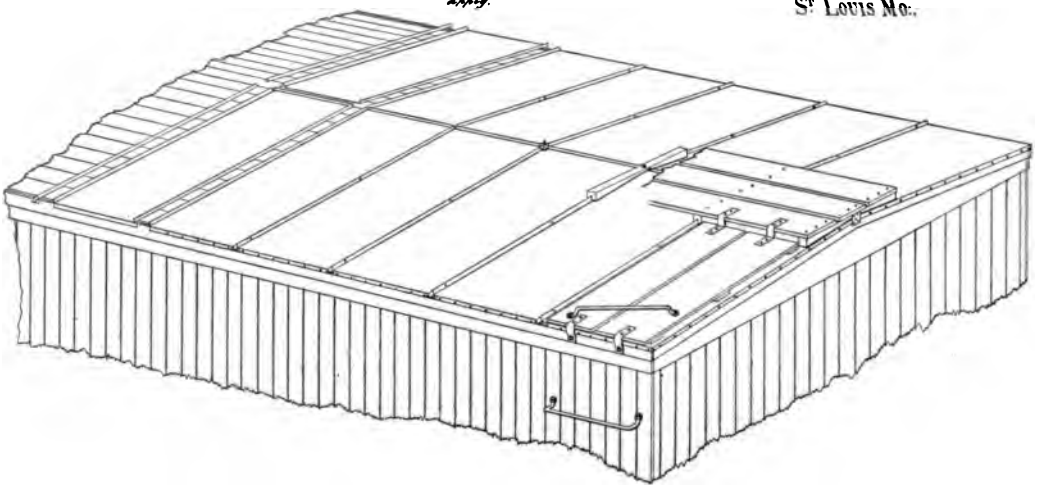
EXCELSIOR CAR ROOF

MANUFACTURED BY THE

EXCELSIOR CAR ROOF COMPANY,

ST. LOUIS MO.

Malleable Iron Corner Cap and Bolt.



EXCELSIOR METAL ROOF.

Complete Bill of All Materials Necessary for the Application of Excelsior Metal Roof to 34 Foot Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M
9	Carlines	Oak	1¾"x 9 "x8 ' 5 "	2 "x 9¼"x8 '9"	122'
1	Ridge pole	Pine	2¼ x 3½x34 0	2½ x 3¾ x34 6	27
4	Purlines	"	1¾ x 2¾x34 0	2 x 3 x34 6	69
2	Side fascia	"	13/16 x 5¾x Sect'ns	1 x 6 x36 0	36
2	" " moulding	"	13/16 x 2¼x "	1 x 3 x36 0	18
2	End "	"	13/16 x11 x8' 10¾"	1 x12 x 9 0	18
4	" " "	"	13/16 x 2¼x4 9	1 x 3 x 5 0	5
22	Roofing	"	13/16 x 5¼x Sect'ns	1 x 6 x36 0	396
3	Running boards	"	⅞ x 7¾x "	1 x 8 x36 0	72
18	" " saddles	Oak		Cuttings	
6	Cleats for short running boards	Pine	⅞ x 3¾x1 ' 9"	1 "x 4 "x2 '0"	4
4	Short running boards	"	⅞ x	1 x10 x4 0	13
2	Running board cleats	Oak	1¾ x 4¾x1 11	2 x 6 x2 0	4
					784'

FORGINGS AND BOLTS.

C. W. W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Weight.
		4	Angles for short running bds.	2 "x ¼" x10 "	6
		4	" " " " "	2 x ¼ x 8	4
1	1	4	" to side plate	½ x 7⅛	1
					11

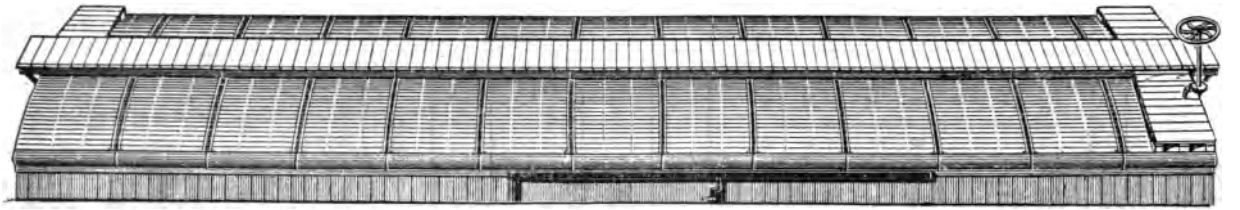
MISCELLANEOUS MATERIAL.

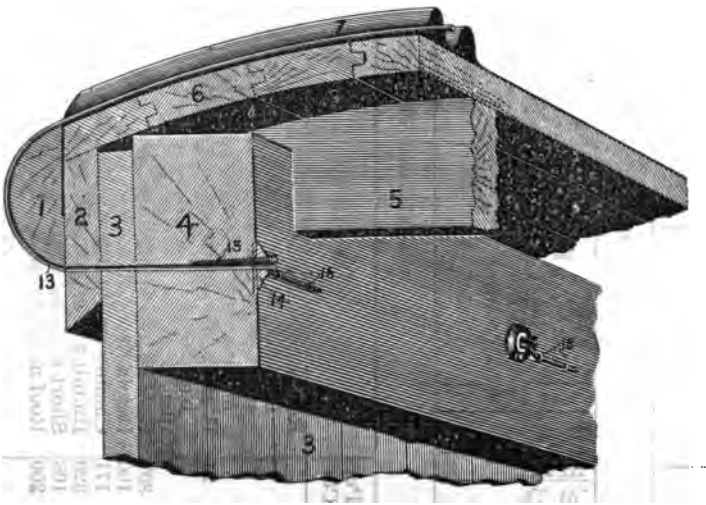
Per Car	Description.	Size.	Wt.
2	Galvanized iron end running board saddle to fascia	3 "x6 " No. 20	½
	Excelsior roof material complete for 34-ft. car, all as supplied by the Excelsior Car Roof Company, St. Louis, Mo		
4	U. S. standard square nuts	For ½" bolt	½
4	Wrought washers	For ½" bolt	
12	Nails, purlines and ridge pole to plate	4 " No. 6 B. W.	½
90	" " " " " " carlines	3¼ " 9 "	1½
183	" running boards	2 " 11 "	1¼
48	" " " short	6d Clinch.	½
360	" fascia	12d Finish.	4
785	" roofing	2 " No. 11 B. W.	5
144	" iron roof to top of car	2 " 6 "	2½
540	" " " " eaves of car	2 " 6 "	8¾
			23½
	Flat head iron wood screws:		
24	Short running board angles to car	1 " No. 16	
10	Galvanized iron to fascia and run. b'd. sad.	1½ " 16	
34			
	Paint material		

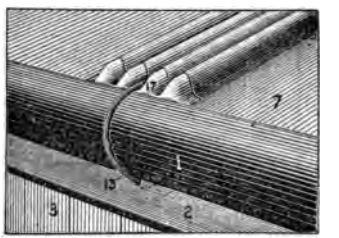
SUMMARY.

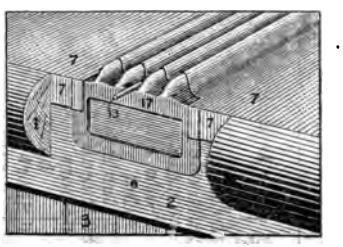
Quantity.		Specifications.	Price	Am'nt.
126	feet.	Lumber, Oak carlines and running board bracket		
77	"	Pine side and end fascia		
396	"	" roofing		
96	"	" ridge pole and purlines		
89	"	" running boards		
784	feet.			
473	"	Kiln drying		
		Excelsior Roof Materials Complete for 34 Foot Car.		
11	lbs.	Wrought iron		
½	"	Galvanized iron		
½	"	Nuts and washers		
4	"	Finishing nails		
19	"	B. W. "		
½	"	Clinch "		
		Paint materials		
34		Wood screws		
		Labor:		
		Lumber yard		
		Mill		
		Car builders		
		Bolt room		
		Blacksmith		
		Iron machine		
		Tinner		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

CABLED STEEL CAR ROOF.









CABLED STEEL CAR ROOF.

Complete Bill of All Materials Necessary for the Application of the Cabled Steel Car Roof to 34 Foot Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
15	Carlines	Oak.	1¼ "x 9 "x 8′ 5 "	2 "x 9¼"x 8′ 9"	202′
22	Roofing	Pine.	13/16x 5¼xSect'ns	1 x 6 x36 0	396
2	Chafing rails	"	1½ x 3 x34 6	1¾ x 3¼ x35 0	33
2	Side Fascia	"	⅞ x 5¾xSect'ns	1 x 6 x36 0	36
2	End "	"	⅞ x11½	1 x12 x 9 0	18
2	Run'g board side rails	"	2 x 3	2¼ x 3¼ x35 0	43
80	Running boards	"	⅞ x 5¼	1 x 6 x 2 0	80
6	Short running board blocks	"		3 x 4 x 0 6	3
6	Short running board rails	Oak.	1 x 4	1¼ x 4¼ x 5 0	13
18	Short running board..	Pine.	⅞ x 5¼	1 x 6 x 2 0	18
2	Running board filling pieces	"	1¾ x 1′ 11 "	2 x 6 x 2 0	4
					846′

FORGINGS AND BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			4	Angle irons for short running b'ds.	3 "x ¼" x 0′ 4 "	3
	1		6	Lag screws " " " "	½ x x 0 7⅛	2
						5

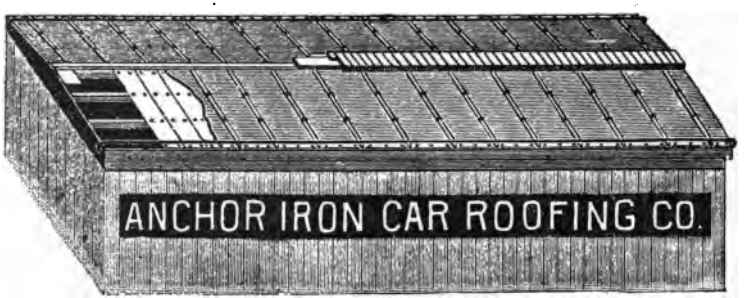
MISCELLANEOUS MATERIAL.

Per Car	Description.	Size.	Wt.
	Roofing materials complete for one 34′ car, including sheets and wire cables. All as supplied by Bannantine Galvanized Iron Manufacturing Company, St. Louis, Mo.		
24	F. H. I. Wood screws, angles to running boards	1 " No. 16	
	Nails:		
897	Roof boards to carlines	2 " 11 B. W.	5¾
190	Fascia to car	2½ " 8 "	2¾
171	Chafing rail to fascia and car	3 " 8 "	3
320	Running boards to side rails	2 " 11 "	2
108	Short running boards	1¾ " 9 "	1
200	Roof metal to ends	1 " 12 "	½
			15
6	Wrought washers	For ½" bolt	⅛
	Paint materials		

CABLED STEEL CAR ROOF—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
215	feet.	Lumber, oak, carlines and		
	"	running board rails		
396	"	pine, roofing		
98	"	" running boards		
83	"	" rails, etc.		
54	"	" fascia and chafing		
		rails		
846	"			
548	"	Kiln drying		
5	lbs.	Wrought iron		
24		F. H. I. wood screws		
15	"	Nails, B. W		
⅛	"	Wrought washers		
		Roofing materials		
		Paint "		
		Labor :		
		Lumber yard		
		Mill		
		Blacksmith		
		Iron machine		
		Bolt room		
		Car builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		


ANCHOR IRON CAR ROOFING CO.

IRON ANCHOR CAR ROOF.

Complete Bill of all Materials Necessary for the Application of the Iron Anchor Car Roof to 34-foot Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
9	Carlines	Oak.	1¾ "x9 "x 8′ 5″	2 "x9¼"x 8′ 9″	122′
1	Ridge pole	Pine	2 x5 x34 0	2¼ x5¼ x34 6	34
4	Purlines	"	1¾ x2¾ x34 0	2 x3 x34 6	69
160	Roofing	"	13/16 x5¼ x	1 x6 x 5 4	427
2	Side fascia	"	⅞ x5¾ x secs.	1 x6 x36 0	36
4	End fascia	"	⅞ x5¾ x	1 x6 x 5 0	10
2	Side fascia mld'ng	"	1⅞ x3¼ x	2¼ x3½ x35 0	46
4	End fascia mld'ng	"	1⅞ x3¼ x	2¼ x3½ x 5 0	13
1	Ridge batten	"	1⅛ x2½ x	1½ x3 x36 0	14
1	Outside ridge pole	"	1 15/16 x5 x	2¼ x5¼ x34 6	34
2	Run'g brd. side r'ls	"	1¾ x3⅛ x	2 x3½ x35 0	41
80	" " sheath'g	"	13/16 x5¼ x	1 x6 x 2 0	80
2	Ridge weather stps	"	1⅛ x1¼ x	1½ x1½ x36 0	14
2	Run'g bd. end sad'ls	Oak.		Cuttings.	
2	" " " cleats	"	1¾ x x	2 x6 x 2 0	4
34	Half round ribs	Pine.	⅞ x2½ x	1 x3 x 5 0	43
6	Short run. bds. r'ls	Oak.	1 x4 x	1¼ x4¼ x 5 0	13
6	" " " bl'ks	Pine.	x x	3 x4 x 0 6	3
18	" " "	"	⅞ x5¼ x	1 x6 x 2 0	18
34	Fascia blocks	"	x x	Cuttings.	
					1021′

FORGINGS AND BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			4	Angle irons for short running boards	3 "x¼"x 0′4 "	3
			2	Safety rails	½ x 36 0	47
1	1		2	Outside ridge pole and plate	½ x 1 5⅛	2
1	1		9	" " " " carlines	½ x 1 2⅛	7
1	1		9	Ridge poles together, B. H.	½ x 0 6⅞	3
2	1		24	Fascia and side plate, "	½ x 0 8⅞	12
2	1		12	" " end plate, "	½ x 0 8⅜	6
			102	Malleable caps and half round ribs, lag	⅜ x 0 4½	14
			4	Safety rail to end fascia, lag	½ x 0 4⅛	1
			6	Short running board, lags	½ x 0 7⅛	2
						97

MISCELLANEOUS MATERIAL.

Per Car	Description.	Size.	Wt.
	Roofing materials, complete for 34′ car, as supplied by the Bannantine Galvanized Iron Manufacturing Co., of St. Louis, Mo.		
24	F. H. I. Wood Screws, angles to running boards	1 " No. 16	
20	Rubber gaskets under ridge pole bolts	⅛	

(Continued.)

IRON ANCHOR CAR ROOF—(Continued.)

MISCELLANEOUS MATERIAL—(Continued.)

Pr.Cr	Description.	Size.	Wt.
	Nails:		
	Roof to carlines	2 " No. 11, B. W.	8
	Center batten and half oval ribs	2 " 11, "	1½
	Galv'ized iron roof to ridge pole & eaves	1½ " 10, "	4
	Weather strips at ridge	2 " 11, "	¾
	Running boards to side rails	2 " 11, "	2
	End running board saddles	3½ " 6, "	½
	Fascia to car	2½ " 8, "	2¾
	" blocks to car	5d cut.	½
	Purlines and ridge pole to carlines	3¼ No. 9, B.W.	1¼
	" " " " " plates	4 " 6, "	½
			21¾
56	U. S. Standard square nuts	For ½" bolt	4¼
92	Wrought washers	" ½ "	3¾
	Paint materials		

SUMMARY:

Quantity.		Specifications.	Price.	Amount.
139	Feet.	Lumber, oak, carlines & run'g bd. cleats		
206	"	pine, ridge poles and purlines		
427	"	" roofing		
105	"	" fascia		
98	"	" running boards		
46	"	" sub-carlines		
1021	"			
578	"	Kiln drying		
97	lbs.	Wrought iron		
24	.....	F. H. I. wood screws		
20	.....	Rubber washers		
4¼	lbs.	Square nuts		
3¾	"	Wrought washers		
½	"	Nails, cut		
21¼	"	" B. W		
		Roof materials complete		
		Paint materials		
		Labor:		
		Lumber yard		
		Mill		
		Blacksmith		
		Iron machine		
		Bolt room		
		Car builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

EMPIRE IRON ROOF.

Complete Bill of all Materials Necessary for the Application of the Empire Iron Roof to 34 Foot Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
9	Carlines	Oak	1¾ "x9 "x 8′ 5 "	2 "x 9¼"x 8′9"	122′
6	Purlines	P'ine	1¾ x3¾ x34 0	2 x 4 x34 6	138
1	Ridge pole	"	1¾ x5 x34 0	2 x 5¼ x34 6	30
2	Side fascia	"	⅞ x2½ x sections	1 x 3 x36 0	18
2	" " m'ld'g	"	1⅜ x2¾ x	1¾ x 3 x36 0	32
2	End "	"	1⅜ x7½ x 8 10¾	1¾ x 8 x 9 0	21
34	Fascia blocks	"	⅞ x2¾ x 0 3	Cuttings.	
160	Upper roofing	"	13/16 x5¼ x	1 x 6 x 5 4	427
1	R'f cla'p at ridge	"	1¾ x4½ x34 6	2 x 4¾ x35 0	28
3	Running boards	"	⅞ x7¾ x sections	1 x 8 x36 0	72
14	Run'g b'd sad'les	Oak		Cuttings.	
2	" " cleats	"	1¾ x x	2 x 6 x 2 0	4
					892′

FORGINGS AND BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			14	Running board angle irons	1 "x ¼" x 1 ′ 0"	12
	1	1	4	Ridge clamp and pole, B. H	½ x 0 5⅞	1
	1	1	2	" " " end plates, B.H.	½ x 1 2⅜	2
	1	1	9	" " " carlines, "	½ x 1 ⅜	7
	1	1	8	End fascia to car	½ x 0 7⅝	4
	1	1	24	Side " " "	½ x 0 7⅞	11
						37

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	Galvanized iron roofing materials complete for 34 foot car		
	Flat Head Iron Wood Screws.		
320	For roof boards to fascia (B. W. nails may be used instead)	2¼" No. 16	
56	For running board angles to saddles and roof clamp	1½ No. 16	
376			
	Nails.		
	Purlines and carlines	3 " No. 8 B.W.	2
	" " plates	4 No. 6 "	¾
	Running boards and saddles	2 No. 11 "	1¼
	Fascia blocks	5 d Cut.	½
	" to car	2½ No. 8 B.W.	2¾
	" moulding	30d Cut.	5
	Toe nailing roof at ridge	6d "	5
			17¼

(Continued.)

EMPIRE IRON ROOF—(Continued.)

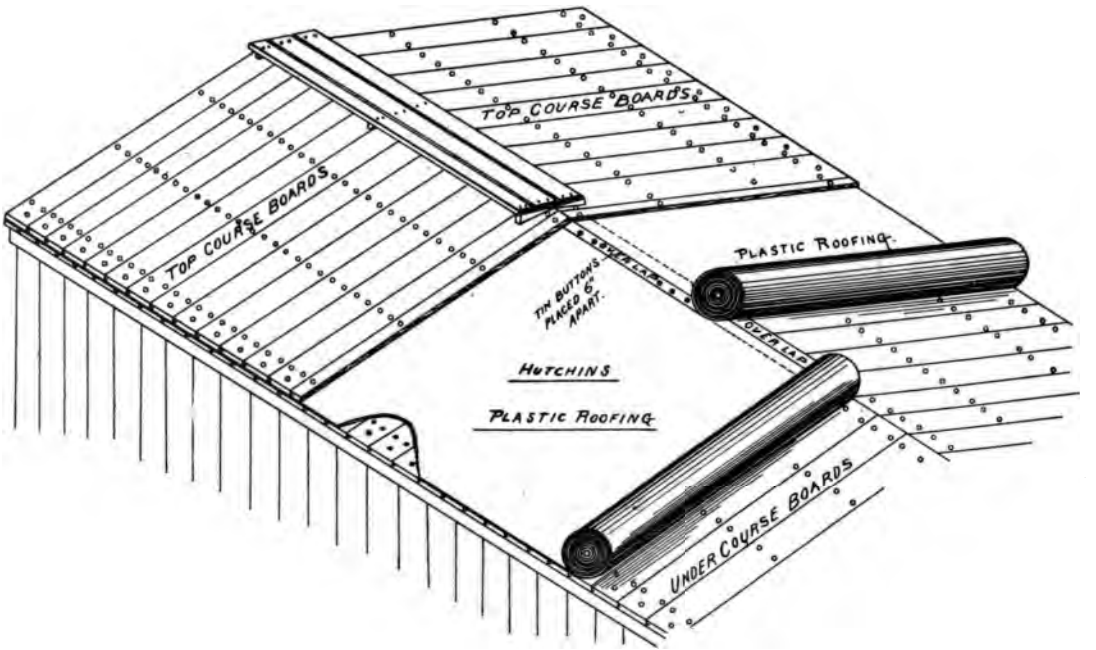
MISCELLANEOUS MATERIALS—(Continued.)

Per Car	Description.	Size.	Wt.
47	U. S. Standard square nuts	For ½" Bolt	3¾
47	Wrought washers	" ½ "	1¾
	Paint Materials		

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
126	Feet.	Lumber, oak, carlines, etc		
196	"	pine, ridge pole & purlines		
71	"	" fascia, etc		
427	"	" roofing		
72	"	" running boards		
892	Feet.			
498	Feet	Kiln drying		
37	Lbs.	Wrought iron		
376		F. H. I. wood screws		
5½	Lbs.	Nails, cut		
11½	"	Nails, B. W		
3½	"	Square nuts		
1½	"	Wrought washers		
		Galvanized iron roofing materials		
		Paint materials		
		Labor:		
		Lumber yard		
		Mill		
		Blacksmith		
		Iron machine		
		Bolt room		
		Car builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

THE HUTCHINS FREIGHT CAR ROOF.



HUTCHINS ROOF.

Complete Bill of All Materials Necessary for the Application of Hutchins' Roof to 34 Foot Car.

LUMBER.

Pcs	Description.	Mat'l	Finished Sizes.	Rough Sizes.	B. M.
9	Carlines	Oak.	1¾"x9 "x8 ' 5 "	2 "x9¼"x8 ' 9"	122 '
1	Ridge pole	Pine	2¼ x3½ x34 0	2½ x3¾ x34 6	27
4	Purlines	"	1¾ x2¾ x34 0	2 x3 x34 6	69
2	Side fascia	"	1¾ x3¾ x34 5⅛	2 x4 x35 0	47
4	End "	"	1¾ x3¾ x4 6	2 x4 x5 0	13
320	Roofing	"	13/16 x5¼ x4 9	1 x6 x5 4	854
3	Running boards	"	⅞ x7¾ x Sect'ns	1 x8 x36 0	72
19	" b'd saddles.	Oak.		Cuttings.	
2	" " cleats.	"	1¾ x4½ x1' 11"	2 "x6" x2' 0"	4
					1208 '

MISCELLANEOUS.

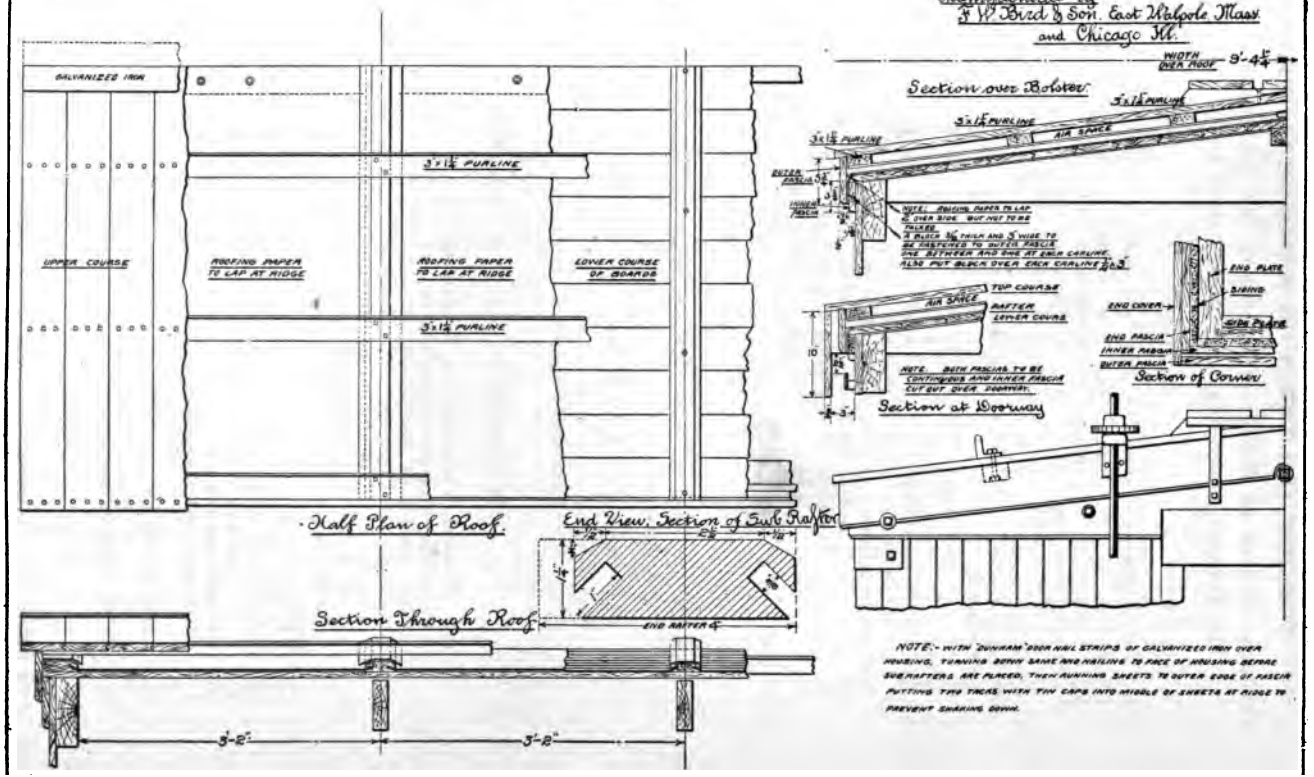
Per Car.	Description.	Size.	Wt.
	Hutchins' roof materials complete, including nails and tins for 34' car; all as furnished by C. B. Hutchins & Sons. Detroit, Mich.		
12	Nails, purlines and ridge pole to plates.	4 "No. 6 B.W.	½
90	" " " " " carlines	3¼ " 9 "	1½
189	" running boards	2 " 11 "	1¼
1440	" lower roofing	2 " 11 "	9
1440	" upper "	3¼ " 9 "	24
76	" running board saddles	3¼ " 9 "	1¼
90	" fascia	40d Cut.	6½
	Paint Materials.		44

SUMMARY.

Quantity.		Specifications.	Price	Am't	
126	Ft.	Lumber, oak; carlines and run. b'd cleats			
96	"	pine; ridge pole and purlines			
60	"	" fascia			
854	"	" roofing			
72	"	" running boards			
1208	"				
854	Ft.	Kiln drying			
		Hutchins' roof materials complete			
6½	lbs.	Cut Nails			
37½	"	B. W. nails			
		Paint materials			
		Labor:			
		Lumber yard			
		Mill			
		Car builders			
		Painters			
		General labor			
		" expense			
		RECAPITULATION.			
		Material			
		Labor			
		General expense			

The Torsion-Proof Car Roof
Patented.

Manufactured by
F. W. Byrd & Son. East Walpole Mass.
and Chicago Ill.



NOTE:- WITH "DUNHAM" DOOR RAIL STRIPS OF GALVANIZED IRON OVER HOUSING, TURNING DOWN SAME AND NAILING TO FACE OF HOUSING BEFORE SUB RAFTERS ARE PLACED, THEN RUNNING SHEETS TO OUTER EDGE OF FASCIA PUTTING TIN TACKS WITH TIN CAPS INTO MIDDLE OF SHEETS AT RIDGE TO PREVENT SHAKING DOWN.

TORSION, COLUMBIA OR NEPONSET ROOF.

Complete Bill of all Materials Necessary for the Application of the Torsion, Columbia or Neponset Roof to 34′ Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
15	Carlines	Oak.	1¾″ x 9 ″x 8′ 5″	2 ″x 9¼″x 8′ 9″	202′
22	Lower roofing	Pine.	⅞ x 5¼ x scn's	1 x 6 x36 0	396
30	Sub-carlines, int	"	1¼ x 3½ x	1½ x 3¾ x 5 0	70
4	" " end	"	1¼ x 4 x	1½ x 4¼ x 5 0	11
6	Sub-purlines	"	1¼ x 3 x34′ 0″	1½ x 3¼ x34 6	84
160	Upper roofing	"	13/16 x 5¼ x	1 x 6 x 5 4	427
2	Side fascia	"	⅞ x 5¾ x	1 x 6 x36 0	36
2	" " moulding	"	⅞ x 3¾ x	1 x 4 x36 0	24
2	End "	"	⅞ x11½ x	1 x12 x 9 0	18
4	" " moulding	"	⅞ x 3¾ x	1 x 4 x 5 0	7
66	Fascia blocks	"	⅜ x 3 x	Cuttings.	.....
3	Running boards	"	⅞ x 7¾ x	1 x 8 x36 0	72
19	" " sad'ls	Oak.	To suit.	Cuttings.	.....
2	" " ex'tn	"	1¾ x 4½ x 1 11	2 x 6 x 2 0	4
					1351′

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1		34	Sub-purlines at eaves, lag	⅜″x6½″	7

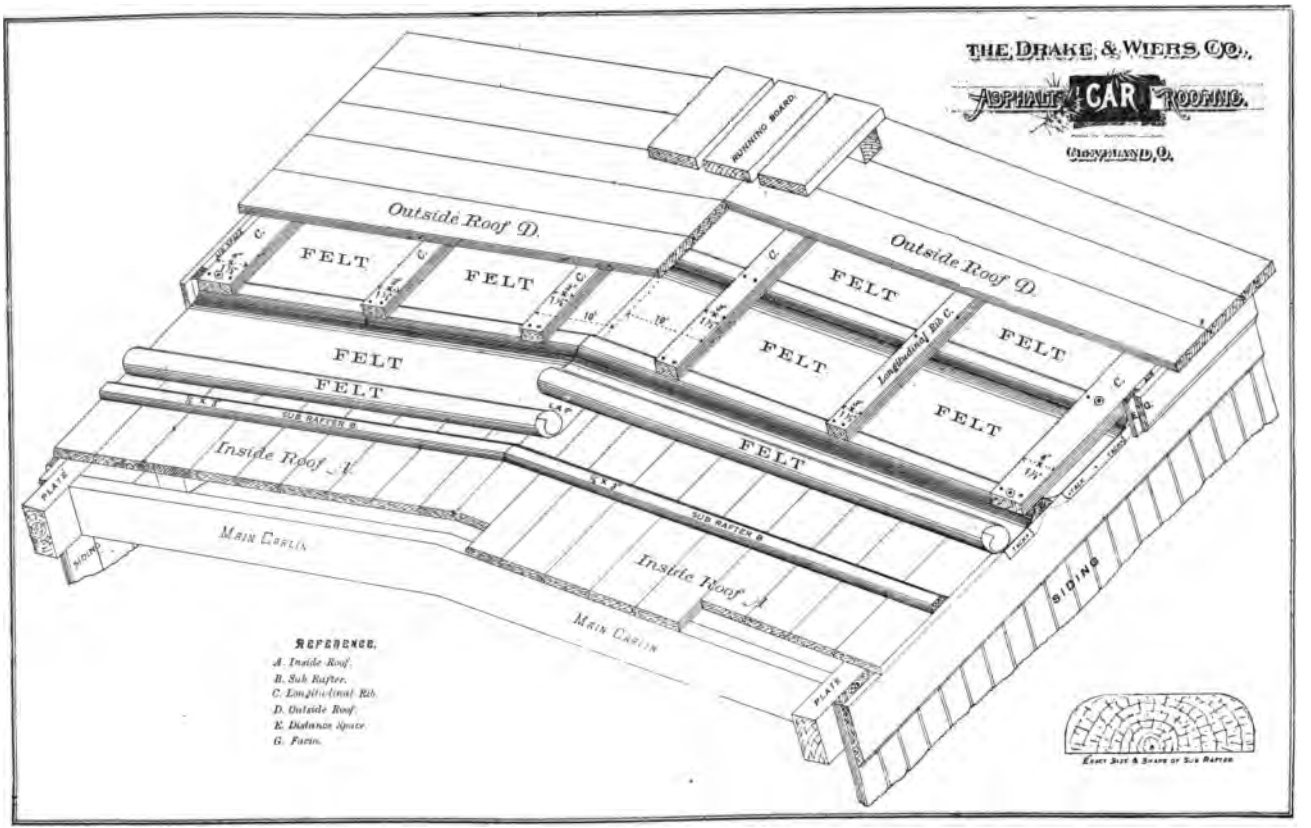
MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
	The Torsion, Columbia or Neponset materials complete, including paper joint caps for 34′ car having 15 carlines equally spaced. All as supplied by F. W. Bird & Son, Monadnock Building, Chicago, Ill.		
1	Galvanized iron for ridge cap, No. 24	6″x35′ 0″ Lin	20¼
	Nails:		
897	Lower roofing	2 ″ No. 11, B. W	5¾
136	Sub-carlines to roof	3½ " 8, "	2¾
204	" purlines to sub-carlines	5 " 6, "	8¼
960	Upper roofing	2 " 11, "	6
189	Running boards to saddles	2 " 11, "	1¼
76	" " saddles to roof	3½ " 8, "	1½
132	Fascia blocks	5 d cut	¾
190	" to car	2¼″ No. 8, B. W	2½
171	" moulding to car	3 " 8, "	3
			31¾
34	Wrought washers	For ⅜″ bolt	1
	Paint materials		

TORSION, COLUMBIA OR NEPONSET ROOF—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
206	feet.	Lumber, oak, carlines, etc....		
81	"	pine, sub-carlines.....		
84	"	" sub-purlines.....		
823	"	" roofing		
85	"	" fascia.....		
72	"	" running boards.....		
1351	"			
908	"	Kiln drying.....		
1	car.	Roofing materials.....		
20¼	lbs.	Galvanized iron.....		
31	"	Nails, B. W....		
¾	"	" cut.....		
7	"	Wrought iron.....		
1	"	Wrought washers.....		
		Paint materials		
		Labor:		
		Lumber yard.....		
		Mill.....		
		Boltroom.....		
		Tinsmith.....		
		Car builder		
		General labor.....		
		" expense.....		
		RECAPITULATION.		
		Materials.....		
		Labor.		
		General expense		


THE DRAKE & WIERS CO.
ASPHALT CAR ROOFING.
CLEVELAND, O.
RUNNING BOARD
Outside Roof D.
Outside Roof D.
FELT
FELT
FELT
FELT
FELT
FELT
FELT
FELT
Longitudinal Rib C.
SUB RAFTER B
SUB RAFTER B
Inside Roof A
Inside Roof A
MAIN CARLIN
MAIN CARLIN
PLATE
PLATE
SIDING
SIDING
REFERENCE.
A. Inside Roof.
B. Sub Rafter.
C. Longitudinal Rib.
D. Outside Roof.
E. Distance Space.
G. Facia.
EXACT SIZE & SHAPE OF SUB RAFTER

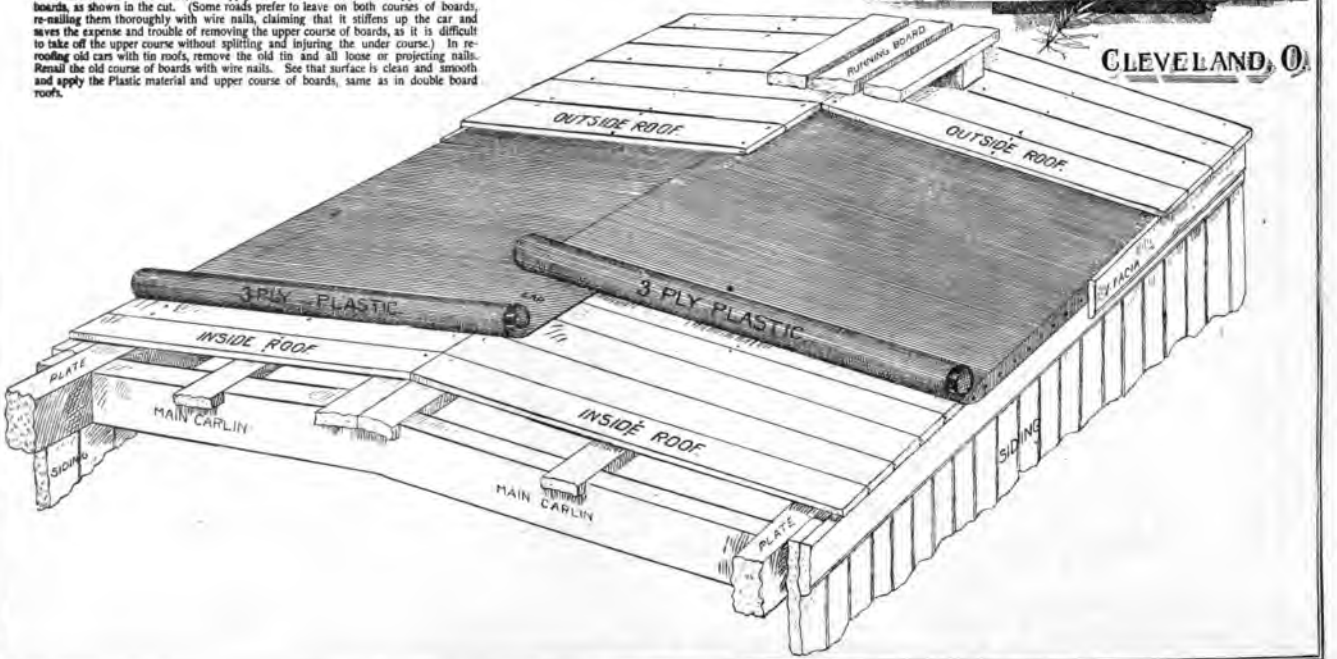
DIRECTIONS.

On new cars, apply as shown in cut. In reroofing old cars, with double board roofs, remove the upper course of boards and all loose or projecting nails. Renail the under course of boards thoroughly with wire nails. SEE THAT UNDER COURSE IS CLEAN AND SMOOTH, then apply the Plastic material and upper course of boards, as shown in the cut. (Some roads prefer to leave on both courses of boards, re-nailing them thoroughly with wire nails, claiming that it stiffens up the car and saves the expense and trouble of removing the upper course of boards, as it is difficult to take off the upper course without splitting and injuring the under course.) In re-roofing old cars with tin roofs, remove the old tin and all loose or projecting nails. Renail the old course of boards with wire nails. See that surface is clean and smooth and apply the Plastic material and upper course of boards, same as in double board roofs.

THE DRAKE & WIERS CO.

3 PLY PLASTIC CAR ROOFING.

CLEVELAND, O.



DRAKE & WIER'S ASPHALT ROOF.

Complete Bill of all Materials Necessary for the Application of Drake & Wier's Asphalt Roof to 34 Foot Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
15	Carlines	Oak	1¾"x9" x8' 5"	2 "x9¼"x 8' 9"	202'
22	Lower roof	Pine	13/16 x5¼ Sections	1 x6 x36 0	396
34	Sub carlines	"	⅞ x3	1 x3 x 5 0	43
2	" purlines	"	1½ x4 Sections	1¾ x4¼ x34 6	43
4	" "	"	1½ x3 "	1¾ x3¼ x34 6	65
160	Upper roofing	"	13/16x5¼x	1 x6 x 5 4	427
2	Side fascia	"	⅞ x5¾ Sections	1 x6 x36 0	36
4	End "	"	⅞ x5¾ "	1 x6 x 5 0	10
2	Sub " side	"	⅞ x3¾ "	1 x4 x36 0	24
4	" " end		⅞ x3¾ "	1 x4 x 5 0	7
34	Fascia blocks	"	⅜ x3 x0 3¾	Cuttings.	
3	Running boards	"	⅞ x7¾ Sections	1 x8 x36 0	72
19	Run'g b'd. saddles.	Oak		Cuttings.	
2	" " cleats	"	1¾ x4½ x1 11	2 x6 x 2 0	4
					1329'

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1		34	Outside sub-purlines to side plate, lags	⅜" x 0' 6½"	7

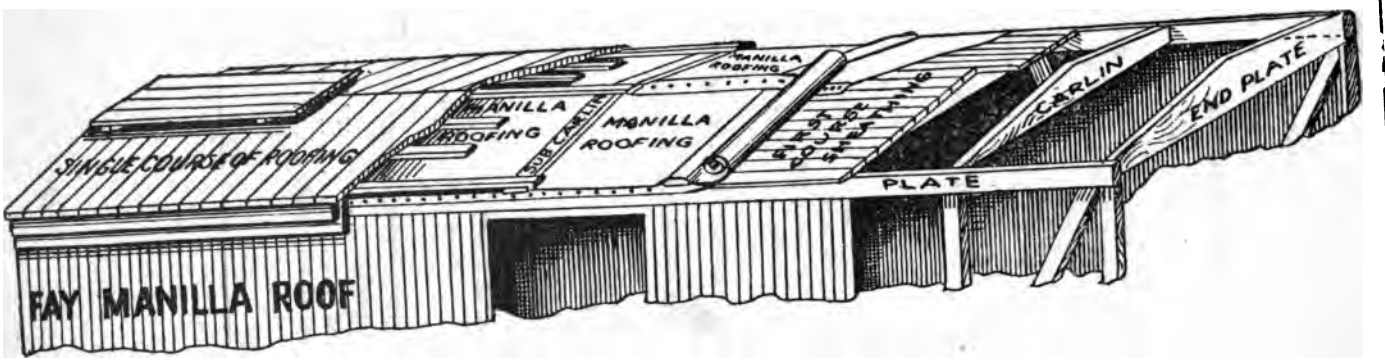
MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	Drake & Wier's Asphalt Roof materials complete, together with Asphalt paint, for 34 foot car, all as supplied by the Drake & Wier Co., of Cleveland, Ohio.		
897	Nails, lower roof to carlines	2 " No. 11, B. W.	5¾
136	" sub-carlines to roof	3½ No. 8, "	2¾
204	" " purlines to sub-carlines	5 No. 6, "	8
960	" top roof to sub-purlines	2 No. 11, "	6
189	" running boards to saddles	2 No. 11, "	1¼
76	" " " saddles to roof	3½ No. 8, "	1½
68	" fascia blocks	5 d Cut.	½
190	" " sub	2¼ No. 8, B. W.	2½
171	" "	3 No. 8, "	3
			31¼
96	10 oz. tacks, asphalt roof to fascia		
	Paint materials		

DRAKE & WIER'S ROOF—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
206	feet.	Lumber, oak, carlines and running board cleats			
823	"	Pine, roofing			
108	"	" sub-purlines			
43	"	" " carlines			
77	"	" fascia			
72	"	" running boards			
1329	"				
900	"	Kiln drying			
7	lbs.	Wrought iron			
1	"	" washers			
30¼	"	B. W. nails			
1	"	Cut "			
1	car.	Roofing materials, complete			
		Paint "			
		Tacks for felt to fascia			
		Labor:			
		Lumber yard			
		Mill			
		Car builders			
		Painters			
		General labor			
		" expense			
		RECAPITULATION.			
		Materials			
		Labor			
		General expense			


MANILLA ROOFING
MANILLA ROOFING
SUB CAP LIN
MANILLA ROOFING
SHINGLE COURSE OF ROOFING
PLATE
CAPLIN
END PLATE
FAY MANILLA ROOF

FAY'S MANILLA ROOF.

Complete Bill of all Materials Necessary for the Application of the Fay Manilla Roof.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
15	Carlines	Oak.	1¾" x9" x 8' 5"	2" x9¼" x 8' 9"	202'
22	Lower roof	Pine.	13/16 x5¼ x sec's	1 x6 x36 0	396
34	Sub-carlines	"	⅞ x2¾ x	1 x3 x 5 0	43
34	" "	"	¾ x2½ x	1 x3 x 5 0	43
2	Sub-purlines	"	1½ x4 x34 0	1¾ x4¼ x34 6	43
4	" "	"	1½ x3 x34 0	1¾ x3¼ x34 6	65
160	Upper roof	"	13/16 x5¼ x	1 x6 x 5 4	427
2	Side fascia	"	⅞ x5¾ x sec's	1 x6 x36 0	36
2	" " moulding	"	⅞ x3¾ x "	1 x4 x36 0	24
4	End "	"	⅞ x5¾ x	1 x6 x 5 0	10
4	" " moulding	"	⅞ x3¾ x	1 x4 x 5 0	7
34	Fascia blocks	"	⅜ x3 x 0 3¾	Cuttings.	
3	Run. bds	"	⅞ x7¾ x sec's	1 x8 x36 0	72
19	" " saddles	Oak.	To suit.	Cuttings.	
2	" " cleats	"	1¾ x4½ x 1 11	2 x6 x 2 0	4
					1372'

BOLTS.

C. W. W.	Nuts.	Pcs.	Description.	Size of Blank	Wt.
1		34	Purlines to carlines, lags	⅜"x0' 6½"	7

MISCELLANEOUS MATERIALS.

Per Car	Description.	Size.	Wt.
	Fay Manilla Roof Materials, complete for 34' car, as supplied by the Fay Manilla Roofing Co., of Camden, N. J.		
	Nails:		
897	Lower course roofing	2 " No.11 B.W.	5¾
960	Upper course roofing	2 " 11 "	6
136	" sub-carlines	3½ " 8 "	2¾
136	Lower sub-carlines	2½ " 8 "	2
190	Fascia to car	2½ " 8 "	2¾
171	" moulding to car	3 " 8 "	3
204	Sub-purlines to sub-carlines	5 " 6 "	8
189	Running boards to saddles	2 " 11 "	1¼
76	" " saddles to roof	3½ " 8 "	1½
68	Fascia blocks	5d Cut.	½
100	Roof paper	1 No.12 B.W.	¼
			33¾
34	Wrought washers	For ⅜" Bolt.	1
	Paint materials		

FAY MANILLA ROOF—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
206	feet.	Lumber, oak, carlines and running board brackets.		
823	"	pine, roofing		
86	"	" sub-carlines		
108	"	" sub-purlines		
77	"	" fascia		
72	"	" running boards		
1372	"			
900	"	Kiln drying		
½	lb.	Nails, cut		
33¼	"	" B. W.		
7	"	Wrought iron		
1	"	" washers		
		Fay's manilla roof materials		
		Paint materials		
		Labor:		
		Lumber yard		
		Mill		
		Bolt room		
		Car builders		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

THE

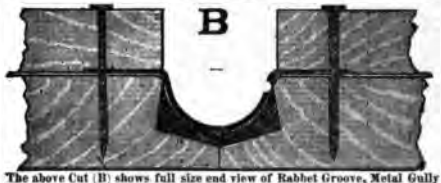
LeGros Improved Patent Car Roof.

WITH GALVANIZED STEEL GULLY COVERS

Patented July 3, 1883, in the United States. ..o. 280,635.
" December 6, 1887, " " " 374,545.
" March 1, 1888, in Canada. " 28,570.
" December 10, 1889, United States. " 416,928.
" January 2, 1890, in Canada.. " 33,955.

LOUISVILLE, KY., JANUARY 1, 1898.

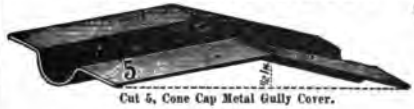
Large Cut A, showing Roof under process of Construction.



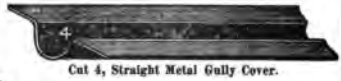
The above Cut (B) shows full size end view of Rabbet Groove, Metal Gully Cover, Nails, and Thickness of Roof and Top Boards.

Cut 1, First Roof Board.

Cut 2, Top Board.



Cut 5, Cone Cap Metal Gully Cover.



Cut 4, Straight Metal Gully Cover.

LeGROS ROOF.

Complete Bill of all Materials Necessary for the Application of the LeGros Roof to 34-Foot Car.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
9	Carlines	Oak.	1¾″x9 ″x 8′ 5 ″	2 ″x9¼″x 8′ 9″	122′
1	Ridge pole	Pine.	2¼ x3½ x34 0	2½ x3¾ x34 0	27
4	Purlines	"	1¾ x2¾ x34 0	2 x3 x34 0	68
2	Side fascia	"	1¾ x3¾ x34 5⅛	2 x4 x35 0	47
4	End "	"	1¾ x3¾ x 4 6	2 x4 x 5 0	13
150	Upper roofing	"	⅝ x4⅝ x(full)	1 x6 x 5 4	400
150	Lower "	"	⅞ x5⅝ x "	1 x6 x 5 4	400
3	Running boards	"	⅞ x7¾ x sectn's	1 x8 x36 0	72
19	" " sadl's	Oak.	....	Cuttings.	.....
2	" " cleats	"	1¾ x4½ x 1 11	2 x6 x 2 0	4
					1153′

MISCELLANEOUS MATERIALS.

PerCar.	Description.	Size.	Wt.
	LeGros Roof Material, complete for 34-foot box car, all as supplied by the Central Paint & Railway Supply Co., Louisville, Ky.		
12	Nails, purlines and ridge pole to plates	4 " No. 6, B.W.	½
90	" " and " " " c'rlin.	3¼ " 9, "	1½
189	" running boards	2 " 11, "	1¼
76	" " " saddles	3¼ " 9, "	1¼
900	" roofing, lower, (flat head)	2¼ " 7, "	13½
3600	" " upper, " "	1½ " 12, "	13
300	" " lower, " "	3 " 7, "	6
90	" fascia	40d cut.	6½
			43½

SUMMARY.

Quantity.		Specification.	Price.	Amount.
		Lumber:		
126	Feet.	Oak carlines, etc		
95	"	Pine ridge pole and purlines		
60	"	" side and end fascia		
800	"	" roofing		
72	"	" running boards		
1153	"			
860	"	Kiln drying		
		LeGros roof materials		
		Paint materials (furnished with roof)		
6½	Lbs.	Cut nails		
37	"	B. W. nails, flat head		
		Labor:		
		Lumber yard		
		Mill		
		Car builder		
		Painters		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

CHAPTER VIII.

SIDE DOORS.

Like the roofs, the question of a satisfactory freight car door for all the varied conditions of service, has received great attention from master car-builders and inventors. This problem was also thoroughly discussed at the last M. C. B. Convention, and resulted in the appointment of a committee to submit designs for side and end doors, including fixtures, for adoption at the Convention meeting in June this year.

The application of the various freight car doors, as with the roofs, often necessitates the changing of the quantity of materials that are not always considered as part of the door equipment.

To illustrate: Any of the patent doors requiring a door hood, materially affects the size and quantity of fascia required, and often affects other roof materials when patent roofs are applied in connection with these doors. It is therefore to be noted that the comparison of all doors presented herewith are based on the use of the ordinary double board roof with one continuous fascia, except where door hoods are required, in which case an ordinary wooden door hood is included, and the quantity of fascia proportionately reduced.

Nearly all manufacturers of patent doors requiring a door hood are in position to furnish a metal hood, but as this is an extra over and above their regular fixtures, it is considered best to make all comparisons on the basis of a wooden hood which can be omitted and the necessary change made in the fascia for the application of the metal hood if so desired.

The comparisons and estimates made on doors are based on the ordinary door as represented on page 239, with such variations only, as were found absolutely necessary.

Below are given such notes as are directly applicable to the various doors presented.

Ordinary Doors.—The Batten Door being the oldest and

most economical, was considered the most practical basis for comparison and IT SHOULD BE UNDERSTOOD THAT ALL BILLS OF MATERIALS ARE BASED UPON THIS CONSTRUCTION REGARDLESS OF WHAT MAY BE SHOWN BY ILLUSTRATIONS, EXCEPT IN SPECIAL CASES AS MENTIONED BELOW.

Wagner Door.—This is a flush door, and one of the oldest of this type and is applied on the royalty basis, the manufacturer furnishing all materials.

It should be noted that the weight of castings in bill of materials presented is taken from patentees' drawings. There are fewer brackets and the weights are much lighter than specified by most roads using this door, in some cases as much as 50 per cent. It is not considered safe to figure less than 115 pounds per car of two side doors. It should also be noted that Malleable locks are included, while many roads using this door specify same to be made of cast iron.

Protection strips at each vertical edge are often applied with this door. They are not called for by the patentee, but if required, increase amount of wrought iron by 4 pieces, 2¼ x⅛x6'7¼" or 25 pounds, and add 72—1½" No. 12 iron wood screws.

Screws are included for track brackets in the bill and shown on drawings; however, lags are sometimes specified.

American Enonomy Door.—This door requires two center battens instead of one, to permit clearance for the center track. No braces are required.

The malleable fittings are furnished complete per car by the Door Company, at a price which will include the royalty.

The American Flush Door.—As the name indicates, this is also a flush door, but differs from the Wagner Door particularly in the apparatus for opening the door, and that the fittings are furnished by the Door Company at a price which includes the royalty.

Moore Door.—There are two methods of application for the Moore Patent Door, one of which is the use of an iron track at the bottom with beveled cast iron shoes attached to the door; the other is the omission of the bottom track and the door casting and the substitution of two beveled cast iron brackets, and one malleable iron burglar proof bracket, (this latter furnished by the Door Company as part of their equipment),

for each door which are secured to the sill. As nearly all railroads applying the door use the latter method, it should be noted that the comparisons herewith are so based. See cut.

Dunham Storm Proof and Q. & C. Trolley Doors.—The only difference between the Dunham and Q. & C. is the construction and the application of the track and the necessary slight changes in the shape of the hanger and the wheel; and the quotation from the Q. & C. Company includes exactly the same relative parts for both doors.

It should be noted under the Dunham Door that the following parts are enumerated as being furnished by the patentees; 4 hangers H; 4 wheels G; 2 lips C; 1 stop D or DD and sufficient track for two doors up to 11 feet each. This leaves the car-builder to supply the handle, the guide and the lock; unless guide A or AA, lock E or some other lock may be specified, for which an extra amount will be charged.

It should be noted under the Q. & C. Door that the following parts are enumerated as being furnished by the patentees: 4 hangers HH; 4 wheels GG; 2 pieces of track up to 11 feet; 8 track braces B; and two stops D, or DD as may be preferred.

The locking wedges KK and locking wedges K are used in connection with their special malleable guide AA as illustrated, and for which an additional price is charged.

If stops DD are used for either of these doors, it requires six additional wood screws per car.

Some roads prefer the use of a frame door in connection with these fixtures to better secure edge joint strips. They also make an equipment for small end doors, furnishing the following parts for each door: 2 hangers No. 10 and 2 wheels No. 10, with sufficient track for small door up to 5 feet in length. It should be further noted that these doors are often applied with but one door guide for each door instead of two as shown on illustration and included in bills of materials.

Kanaly Door.—An exact reproduction of the patentees working drawings accompanies bill of materials for this door, from which it should be noted that the combination seal lock and handle are a part of the fixtures and furnished by the Door Company.

Coburn Door.—The special feature of this door is that it is hung centrally. The quotation for this equipment simply includes the track, track brackets and hangers; the extra parts, such as locks, stops and steel hood, are furnished if so desired, but an additional price is charged for them.

Eubank Door.—The illustration accompanying bill of materials shows their door in various positions, also all the details necessary for its application, from which will be seen that the construction of the door proper differs very materially from common practice.

A complete list of parts furnished by the Door Company is included in the bill of material.

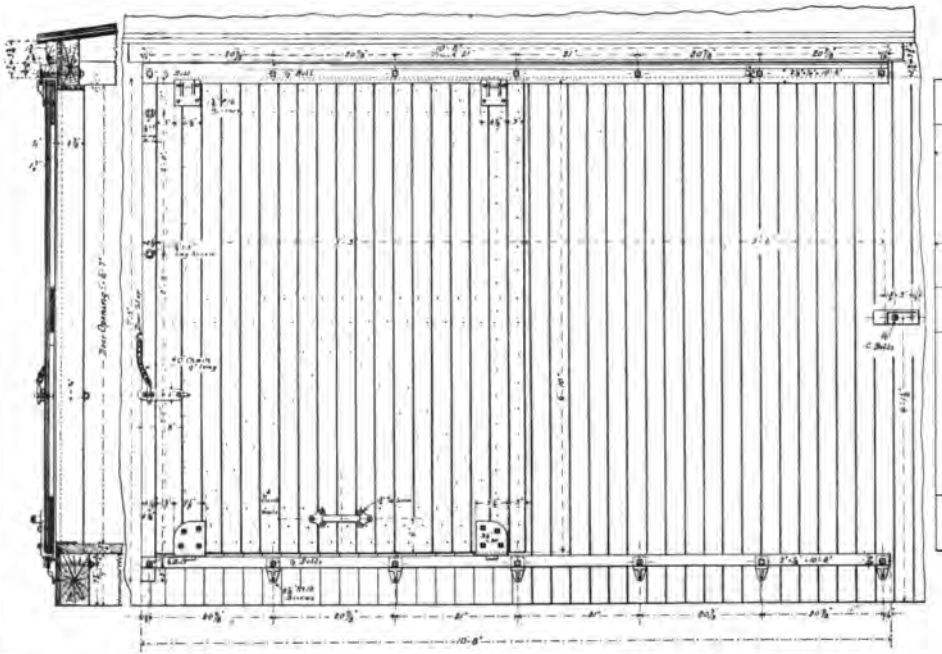
A. B. Pullman Door.—The principal feature of this door is the substitution of balls for rollers, and the application of a spark strip behind the door. The lock is a part of the regular fixtures and furnished with them.

Mooney Lone Star Side Door.—This door is manufactured on the Royalty basis, the car manufacturer furnishing all materials.

The application of this door necessitates the door posts being rabbetted on the taper, the door being flush at the bottom only. The illustration accompanying the bill of material clearly shows the application.

The Smart Automatic Flush Door.—As the name indicates this is a flush door, the special features of the design being the straight track, and having the rollers loose on their axle, allowing both sides of the door to close at the same time. Our bill of materials shows the parts furnished by the Door Company.

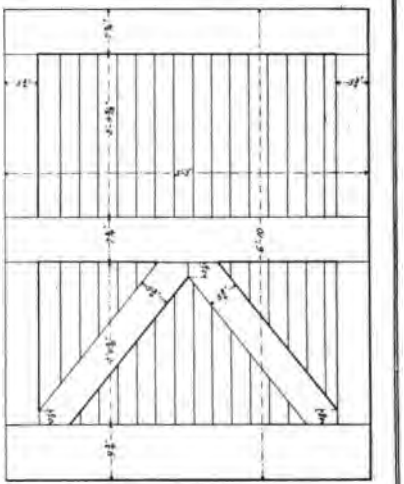
NOTE.—It was impossible to get drawings from which correct bills of material could be made for the following doors: Chamberlain, Safety, Security, Decatur, Hoke, Taylor and Kaldrider.



Cross Section

Side Elevation

Inside View of Door.



ORDINARY

SIDE DOOR FOR BOX CARS

ORDINARY CAR DOOR.

Complete Bill for all Materials Necessary to Apply Ordinary Door to Car.—(Two Side Doors, 5 Foot Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
2	Top rails	Pine.	7/8"x7¾"x 5'3"	1" x 8" x 6'0"	8
2	Center rails	"	7/8 x7¾ x 5 3	1 x 8 x 6 0	8
2	Bottom rails	"	7/8 x9¾ x 5 3	1 x10 x 6 0	10
8	Stiles	"	7/8 x5¾ x 2 4⅜	1 x 6 x 2 6	10
4	Braces	"	7/8 x5¾ x 3 2½	1 x 6 x 3 6	7
25	Sheathing	"	13/16x5¼ x 6 10	1 x 6 x 7 0	88
2	Top track furring	Oak.	2 9/16x2¾ x 10 8	3 x 3 x11 0	17
2	Closed stop	"	2⅛ x2½ x 7 3	2¼ x 2¾ x 7 6	8
2	Headers	Pine.	¾ x4¾ x 5 0	1 x 6 x 5 0	5
2	Side Fascia	"	1¾ x3¾ x 34 5⅛	2 x 4 x35 0	47
					208

CASTINGS.

Pcs.	Patterns	Description.	Material.	Wt.
14		Bottom track brackets	Gray Iron	21
4		Top guides	"	12
4		Bottom shoes	"	24
2		Open stops	"	10
2		Handles	"	6
				73

FORGINGS.

C. W.	W.W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3½"x ¼"x 5' 0"	29
			2	Top guides	2½ x ¼ x10 8	44
			2	Bottom tracks	2 x ⅛ x10 8	71
			2	Hasps	2 x 5/16 x 0 8	3
	1	1	2	" eye bolt	1½ x ½ x 4½	2
			2	" staples	5/16 x 0 6	1
			2	" pins	⅜ x 0 4	1
			2	" pin chain staple	⅛ x 0 2	
						150

ORDINARY CAR DOOR—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
		1	14	Top guide to plate	½" x 8½"	7
	1	1	14	Bottom track and sill	½ x 9¼	7
	1		4	Closed stop and door post, lag.	½ x 6¼	1
		1	2	Open " " girth, C. B.	½ x 6½	1
		1	16	Shoes and doors, C. B.	⅜ x 3⅜	2
						18
					Forgings	150
						168

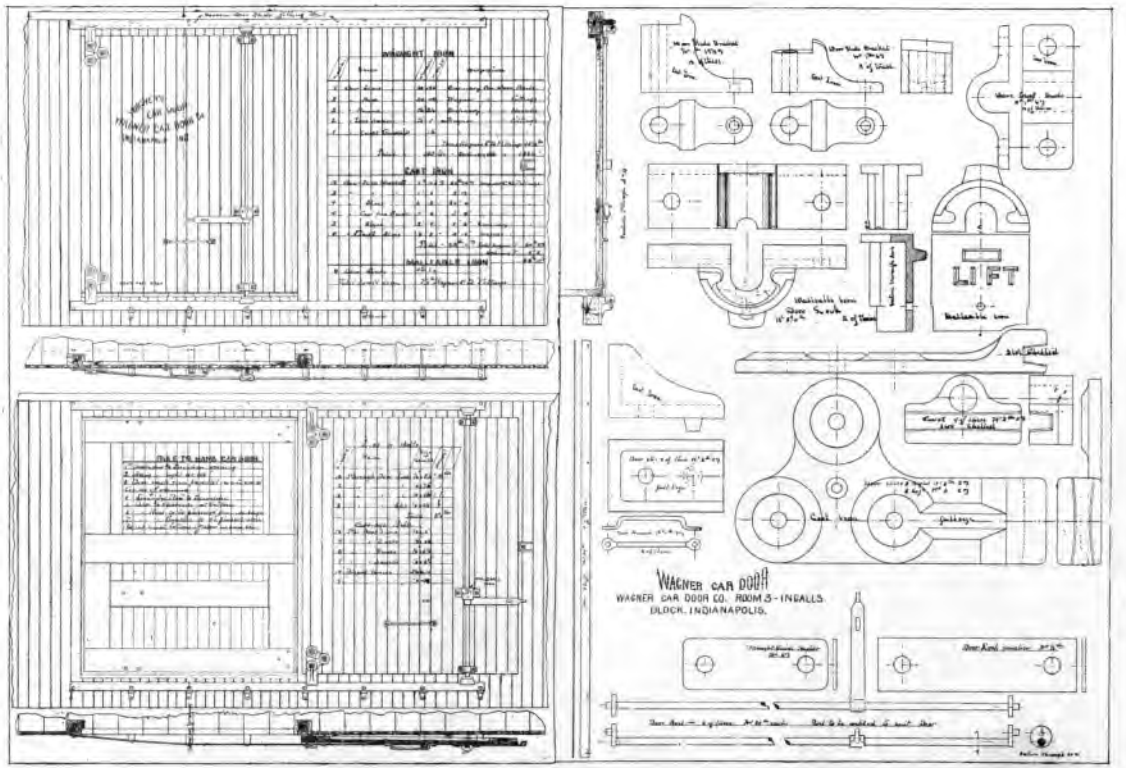
MISCELLANEOUS.

Per Car	Description.	Size.	Wt.
2	Door pin chain	No. 0 x 9"	
72	Nails, fascia	40 d Cut	5
396	Nails, sheathing	6 d Clinch	3½
	Flat Head Iron Wood Screws.		
24	For threshold plates	1¾" No. 16	
16	" guides	" "	
12	" Handles	" "	
14	Track brackets	2½ No. 18	
66			
16	U. S. standard square nuts	For ⅜" bolts	1
32	" " " "	" ½ "	2
			3
38	Wrought iron washers	For ½" bolts	1
			4

ORDINARY CAR DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
47	feet.	Lumber, Pine fascia			
48	"	" rails, etc			
88	"	" sheathing			
25	"	Oak, short			
208	feet.				
183	feet.	Kiln Drying			
73	lbs.	Castings			
168	"	Wrought iron			
3	"	Nuts			
1	"	Washers			
3½	"	6d clinch nails			
5	"	20d cut nails			
18	ins.	Door chain			
66		Wood screws			
		Labor:			
		Lumber yard			
		Mill			
		Car builder			
		Iron machine			
		Bolt room			
		Blacksmith			
		General labor			
		" expense			
		RECAPITULATION.			
		Materials			
		Labor			
		General expense			


LIFT
WAGNER CAR DOOR
WAGNER CAR DOOR CO. ROOM 5 - INGALLS BLOCK, INDIANAPOLIS.

WAGNER CAR DOOR.

Complete Bill of all Materials Necessary to Apply Wagner Door to Car.

(Two Side Doors, 5-foot Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished size.	Rough Size.	B. M.
2	Top rails	Pine.	⅞ "x 7¾"x 5′ 1 "	1"x 8"x 6′ 0"	8′
2	Center rails	"	⅞ x 7¾ x 5 1	1 x 8 x 6 0	8
2	Bottom rails	"	⅞ x 9¾ x 5 1	1 x10 x 6 0	10
8	Stiles	"	⅞ x 5¾ x 2 3	1 x 6 x 2 6	10
4	Braces	"	⅞ x 5¾ x 3 1	1 x 6 x 3 6	7
24	Sheathing	"	13/16x 5¼ x 6 7½	1 x 6 x 7 0	84
2	Top track furring	Oak.	1¾ x 2¾ x 9 7½	2 x 3 x 9 9	10
2	Headers	Pine.	⅞ x 2¾ x 5 0	1 x 3 x 5 0	3
2	Lift furring	"	⅞ x 5¾ x 1 1½	1 x 6 x 1 6	2
2	Fascia	"	1¾ x 3¾ x34 5⅛	2 x 4 x35 0	47
					189′

CASTINGS.

Pcs.	Description.	Mat'l.	Wt.
12	Slide brackets	Gray Iron.	23
2	" "	" "	3
4	Door shoes, right and left	" "	24½
4	Rod guides	" "	5½
4	" shoes	" "	9
2	Open stops	" "	10
2	Door handles	" "	6
			81
2	Locks	Malleable Iron.	7½

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3½" x¼"x5′ 0"	29
			4	Tracks, top and bottom	2½ x⅜ x9 7½	120
			2	Eccentric shafts	1 x 7 6	40
			2	" " hasps	2 x⅜ x1 8	8
			2	" " " staples	⅜ x 0 6¼	1
			2	" " " "	⅜ x 0 6¼	1
			2	Pin chain staples	5/16 x 0 3¼	1
			2	"	½ x 0 4	1
			2	Lock washers	1¼ x⅛ x0 7	1
			4	Rod guide washers	1¾ x⅛ x0 5	2
			2	Washers, end bottom track	2 x⅜ x0 2½	1
						205

WAGNER DOOR—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	12	Track to sill	½"x10¾"	7
	1	1	2	" " "	½ x 9½	1
	1	1	2	" " "	½ x 8½	1
	1	1	12	" " plate	½ x 8⅝	5
	1	1	4	" " "	½ x 8	2
	1	1	2	" " "	½ x 6¼	1
		1	12	Shoes to door, C. B	½ x 3⅞	3
		1	8	Rod guides to door, C. B	½ x 3⅝	1
		1	4	Lift to door	½ x 3⅝	1
		1	2	Stops to girth	½ x 6½	1
						23
					Forgings	205
						228

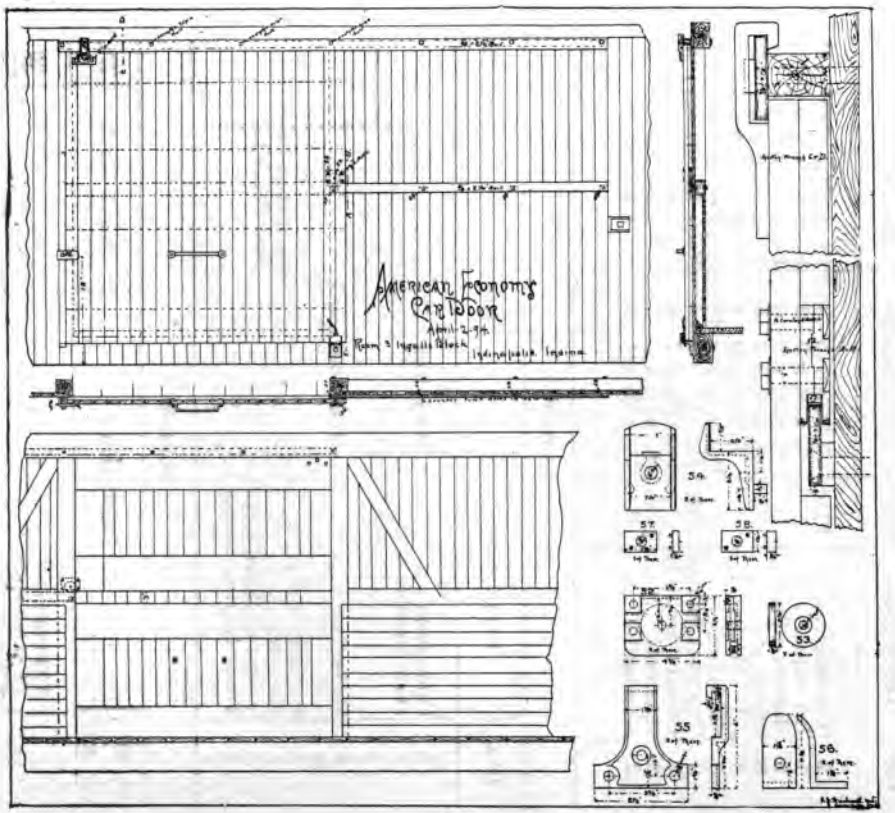
MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
	Royalty per car, (Wagner Car Door Co., Indianapolis, Ind.)		
	Nails, fascia to plate	40 d cut	5
	" sheathing to cleats, etc	6 d clinch	3½
2	Door pin chains	No. 0x9"	
	Flat Head Iron Wood Screws:		
24	Threshold	1¾" No. 16	
14	Track brackets	2½ " 18	
4	Shoes to door	1¾ " 16	
12	Door handle	1¾ " 16	
54			
60	Nuts, U. S. Standard square	For ½" bolt	5
32	Wrought washers	" ½ "	1

WAGNER CAR DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
48	feet.	Lumber, pine rails, etc.			
84	"	" sheathing			
47	"	" fascia			
10	"	Oak			
189	"				
132	"	Kiln drying			
81	lbs.	Castings, gray iron			
7½	"	" malleable iron			
228	"	Wrought iron			
		Royalty per car			
5	lbs.	Nails, 40d cut			
3½	"	" 6d clinch			
1½	feet.	Chain, No. 0			
54		Wood screws			
5	lbs.	Square nuts			
1	"	Wrought washers			
		Labor:			
		Lumber yard			
		Mill			
		Blacksmith			
		Iron machine			
		Bolt room			
		Car builder			
		General labor			
		" expense			
		RECAPITULATION.			
		Materials			
		Labor			
		Royalty			
		General expense			


American Economy
Car Door
April 2-9th
Room 3 Ingalls Block
Fairmount Indiana
54.
57.
58.
53.
55.
56.

AMERICAN ECONOMY DOOR.

Complete Bill of all Materials Necessary to Apply American Economy Door to Car.

(Two Side Doors, 5 Foot Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
2	Top rails	Pine	7/8" x 7 3/4" x 5' 3"	1" x 8" x 6' 0"	8'
4	Int. rails	"	7/8 x 7 3/4 x 5 3	1 x 8 x 6 0	16
2	Bottom rails	"	7/8 x 7 3/4 x 5 3	1 x 8 x 6 0	8
8	Stiles	"	7/8 x 5 3/4 x 2 0	1 x 6 x 2 0	8
2	" blocks	"	7/8 x 3 x 0 7	1 x 4 x 0 9	1
25	Sheathing	"	13/16 x 5 1/4 x 6 10	1 x 6 x 7 0	88
2	Top track furring	Oak	1 1/4 x 1 7/8 x 10 8	1 1/2 x 2 1/4 x 11 0	6
2	Closed door stops	"	2 1/8 x 2 1/2 x 7 3	2 1/4 x 2 3/4 x 7 6	8
2	Headers	Pine	3/4 x 4 3/4 x 5 0	1 x 6 x 5 0	5
2	Side fascia	"	1 3/4 x 3 3/4 x 34 5 1/8	2 x 4 x 35 0	47
					195'

CASTINGS.

Pcs.	Description.	Material.		Weight
2	Open stops	Gray iron		10
2	Door handles	" "		6
				16
2	Roller box	Malleable iron	Furnished by Door Comp'y.	
2	" "	" "		
2	Bottom Guides	" "		
2	Hangers	" "		
2	Guides at closed stops	" "		
2	Track furring blocks	" "		
6	" " "	" "		

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3 1/2" x 1/4" x 5' 0"	29
			2	Center track	2 1/4 x 3/8 x 5 3	30
			2	Top track	2 1/2 x 3/8 x 10 8	67
			2	Door wedges	3/4 x 3/4 x 0 3 1/2	
			2	" " chain staples	1/8 x 0 2 1/2	1
			2	Hasps	2 x 3/8 x 0 8	3
	1	1	2	" eyebolt	1 1/2 x 1/2 x 4 1/2	2
			2	" staples	3/8 x 0 6	
			2	" pins	1/2 x 0 4	1
			2	" " chain staples	1/8 x 0 2 1/2	
						133

AMERICAN ECONOMY DOOR.—(Continued.)

BOLTS.

C. W. W. W	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
1	1	8	Top track to plate	$\frac{1}{2}$"x 0" 8 "	4
1	1	6	" " " " counter head	$\frac{1}{2}$ x 0 $7\frac{1}{4}$	2
1	1	2	Center track to door post counter head	$\frac{1}{2}$ x 0 $6\frac{3}{8}$	1
1	1	6	Center track to girth	$\frac{1}{2}$ x 0 $6\frac{3}{8}$	2
1	1	6	Hanger to door, C. B.	$\frac{1}{2}$ x 0 $3\frac{5}{8}$	1
1	1	8	Roller box to door C. B.	$\frac{1}{2}$ x 0 $3\frac{1}{2}$	1
1	1	2	Bottom guide to sill	$\frac{5}{8}$ x 0 $8\frac{3}{8}$	1
1		4	Closed stop to post, lag	$\frac{1}{2}$ x 0 $6\frac{1}{4}$	1
		2	Guide to stop and post, lag	$\frac{1}{2}$ x 0 $6\frac{5}{8}$	1
	1	2	Open stop to girth, C. B.	$\frac{1}{2}$ x 0 $6\frac{1}{2}$	1
					15
				Forgings	133
					148

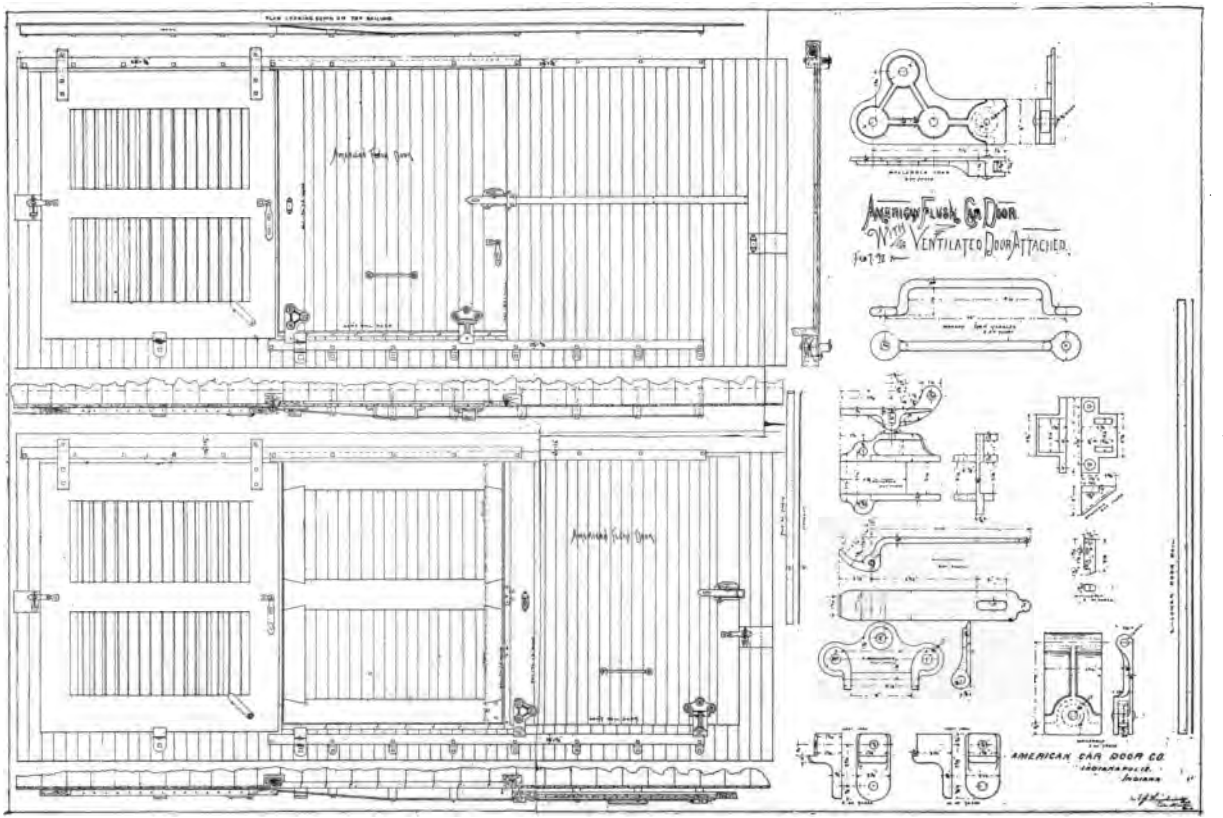
MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	One set of malleables complete for two doors, as supplied by the American Car Door Company, of Indianapolis, Ind., including two of each pattern, Nos. 52 to 57, and six from No. 58. Price to include royalty.		
2	Door pin chain	No. 0' x9"	
2	" wedge chain	" 0 x9	
72	Nails for fascia	40d cut.	5
396	" " sheathing, etc	6d clinch.	$3\frac{1}{2}$
			$8\frac{1}{2}$
	Flat head iron wood screws:		
24	For threshold plates	$1\frac{3}{4}$ No. 16.	
12	Door handles	$1\frac{1}{4}$ " 16.	
36			
40	U. S. standard square nuts	For $\frac{1}{2}$" bolt.	3
2	" " " "	" $\frac{5}{8}$ "	1
			4
42	Wrought washers	For $\frac{1}{2}$" bolt.	1
2	" "	" $\frac{5}{8}$ "	1
			2

AMERICAN ECONOMY DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
46	feet.	Lumber, pine rails, etc			
88	"	" sheathing ...			
47	"	" fascia			
14	"	oak, furring, etc..			
195	"				
134	"	Kiln drying			
16	lbs.	Castings, gray iron.			
148	"	Wrought iron.....			
1	set.	Economy door fixtures, complete, including royalty.			
3	ft.	Door pin chain			
5	lbs.	40d cut nails			
3½	"	6d clinch nails			
36		Wood screws			
4	"	Square nuts.....			
2	"	Wrought washers.			
		Labor :			
		Lumber yard.....			
		Mill.			
		Car builders			
		Bolt room			
		General labor.			
		" expense			
		RECAPITULATION.			
		Materials.....			
		Labor.			
		General expense			


AMERICAN FLUSH CAR DOOR
WITH VENTILATED DOOR ATTACHED.
AMERICAN CAR DOOR CO.
INDIANAPOLIS,
INDIANA

AMERICAN FLUSH DOOR.

Complete Bill of all Materials Necessary to Apply American Flush Door to Car.

(Two Side Doors, 5-Foot Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Sizes.	Rough Sizes.	B.M.
2	Top rails	Pine.	⅞ "x 7¾"x 5′ 1 ".	1"x 8"x 6′ 0"	8′
2	Center rails	"	⅞ x 7¾ x 5 1 .	1 x 8 x 6 0	8
2	Bottom "	"	⅞ x 9¾ x 5 1 .	1 x10 x 6 0	10
8	Stiles	"	⅞ x 5¾ x 2 3 .	1 x 6 x 2 6	10
4	Braces	"	⅞ x 5¾ x 3 1 .	1 x 6 x 3 6	7
24	Sheathing	"	13/16x 5¼ x 6 7½ .	1 x 6 x 7 0	84
2	Top track furring	Oak.	1¾ x 2¾ x 9 7½ .	2 x 3 x 9 9	10
2	Headers	Pine.	⅞ x 2¾ x 5 0 .	1 x 3 x 5 0	3
2	Fascia	"	1¾ x 3¾ x34 5⅛ .	2 x 4 x35 0	47
					187′

CASTINGS.

Pcs.	Deseription.	Mat'l.	Wt.
12	Rail brackets	Gray Iron.	42
2	" "	" "	5
2	Open stops	" "	10
2	Door handles	" "	6
	Malleables furnished by Door Co. See Miscellaneous.		63

FORGINGS.

C. W	W.W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3½ "x ¼"x5′ 0 "	29
			2	Tracks	2½ x ⅜ x9 7½	60
			2	Top guides	2½ x ⅛ x9 7½	20
			2	Pin chain staples	3/16 x 0 3¼	1
			2	"	½ x 0 4	1
			4	Hasp staples	⅜ x 0 6¼	1
			2	Washers, end of track	2 x ⅜ x0 2½	1
			2	Chafing irons at girth	2 x ⅛ x5 3	9
						122

AMERICAN FLUSH DOOR—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	12	Track to sill	$\frac{1}{2}$″x0′ $10\frac{3}{4}$″	7
	1	1	2	" " "	$\frac{1}{2}$ x0 $9\frac{1}{2}$	1
	1	1	2	" " "	$\frac{1}{2}$ x0 $8\frac{1}{2}$	1
	1	1	12	Guide to plate	$\frac{1}{2}$ x0 $8\frac{5}{8}$	5
	1	1	2	" " "	$\frac{1}{2}$ x0 8	1
	1	1	2	" " "	$\frac{1}{2}$ x0 $6\frac{1}{4}$	1
		1	12	Shoes to door	$\frac{1}{2}$ x0 $3\frac{7}{8}$	3
	1	1	4	Lock to door, B. H.	$\frac{1}{2}$ x0 $3\frac{5}{8}$	1
		1	2	Stop to girth	$\frac{1}{2}$ x0 7	1
		1	2	Hinge bolts for door shoes	$\frac{1}{2}$ x0 $6\frac{1}{2}$	1
						22
					Forgings	122
						144

MISCELLANEOUS MATERIAL.

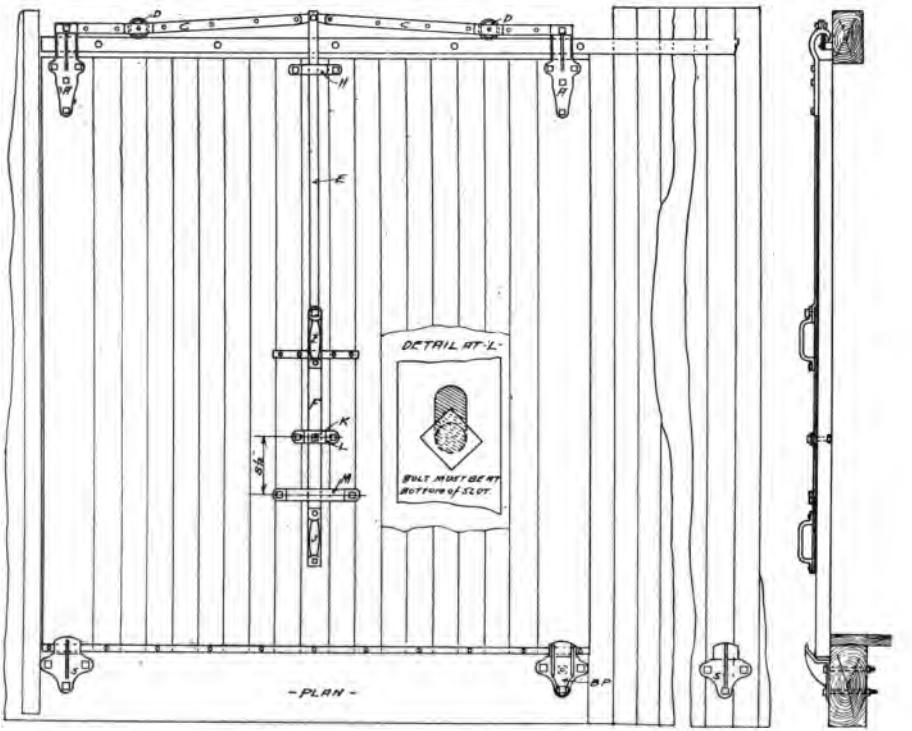
Per Car.	Description.	Size.	Wt.
	One set of malleable castings for two doors to include:		
2	No. 9 lock levers		
2	2 and 3 hinged shoes		
2	4 solid "		
2	5 catches		
2	6 locks		
2	7 " lifts		
	All as furnished by the American Car Door Co., of Indianapolis, Ind., price to include royalty.		
2	Door pin chain	No. 0x9″	
	Flat Head Iron Screws:		
14	Track brackets	$2\frac{1}{8}$″ No. 18,	
24	Threshold	$1\frac{3}{4}$ " 16,	
4	Door catch to post	$2\frac{1}{8}$ " 18,	
20	Chafing iron to girth	$1\frac{1}{4}$ " 12,	
12	Door handles	$1\frac{3}{4}$ " 16,	
74	Nails for sheathing	6 d Clinch.	$3\frac{1}{2}$
	" " fascia	40 d Cut	5
52	U. S. square nuts	For $\frac{1}{2}$″ bolts	4
36	Wrought washers	" $\frac{1}{2}$ "	2

AMERICAN FLUSH DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
46	feet.	Lumber, pine rails, etc.....		
10	"	pine stiles, etc		
84	"	" sheathing.....		
47	"	" fascia		
187	"			
130	"	Kiln drying.....		
63	lbs.	Castings.....		
144	"	Wrought iron.....		
1	set.	American Flush complete fittings, including royalty.....		
74		Wood screws.....		
3½	lbs.	Nails, 6d clinch.....		
5	"	" 40d cut.....		
4	"	Square nuts.....		
2	"	Wrought washers.....		
1½	feet.	Door pin chain.....		
		Labor :		
		Lumber yard.....		
		Mill.....		
		Blacksmith.		
		Iron machine.		
		Bolt room		
		Car builders		
		General labor.		
		" expense		
		RECAPITULATION.		
		Materials.....		
		Labor		
		General expense.....		

- MOORE CAR DOOR -



MOORE CAR DOOR CO.
CHICAGO - U.S.A. -

MOORE PATENT CAR DOOR.

Complete Bill of all Materials Necessary to Apply Moore Door to Car.

(Two Side Doors, 5-foot Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
2	Top rails	Pine.	$\frac{7}{8}$″ x 7$\frac{3}{4}$″ x 5′ 3″	1″ x 8″ x 6′ 0″ ..	8′
2	Center rails	"	$\frac{7}{8}$ x 7$\frac{3}{4}$ x 5 3	1 x 8 x 6 0 ..	8
2	Bottom rails	"	$\frac{7}{8}$ x 9$\frac{3}{4}$ x 5 3	1 x10 x 6 0 ..	10
8	Stiles	"	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 2 4$\frac{3}{8}$	1 x 6 x 2 6 ..	10
4	Braces	"	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 3 2$\frac{1}{2}$	1 x 6 x 3 6 ..	7
25	Sheathing	"	$\frac{13}{16}$ x 5$\frac{1}{4}$ x 6 10	1 x 6 x 7 0 ..	88
2	Top track furring	Oak.	1 x 1$\frac{1}{4}$ x10 8	1$\frac{1}{4}$ x 1$\frac{1}{2}$ x11 0 ..	3
2	Closed stop	"	2$\frac{1}{8}$ x 2$\frac{1}{2}$ x 7 3	2$\frac{1}{4}$ x 2$\frac{3}{4}$ x 7 6 ..	8
2	Headers	Pine.	$\frac{7}{8}$ x 4$\frac{3}{4}$ x 5 0	1 x 6 x 5 0 ..	5
2	Side fascia	"	1$\frac{3}{4}$ x 3$\frac{3}{4}$ x14 3	2 x 4 x16 0 ..	21
2	" "	"	1$\frac{3}{4}$ x 3$\frac{3}{4}$ x 9 6	2 x 4 x10 0 ..	13
4	Hood block	Oak.	4$\frac{1}{4}$ x 7$\frac{1}{4}$ x 0 7	4$\frac{1}{2}$ x 7$\frac{1}{2}$ x 0 9 ..	3
2	Hoods	Pine.	$\frac{7}{8}$ x 7$\frac{1}{4}$ x10 8	1 x 8 x12 0 ..	16
	Furring blocks, for straps, L. & M.	Pine.	$\frac{7}{8}$ x 9 x 2 0	1 x10 x 2 0	3
					203′

CASTINGS.

Pcs.	Description.	Mat'l.	Wt.
4	Sill brackets	Gray Iron.	28$\frac{1}{2}$
2	Open stops	" "	10
			38$\frac{1}{2}$

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3$\frac{1}{2}$″ x $\frac{1}{4}$″ x 5′ 0″	29
			2	Top Tracks	2 x $\frac{3}{8}$ x10 8	71
			2	Chafing strip, bottom door	1$\frac{1}{2}$ x $\frac{5}{16}$ x 5 6	10
			2	Hasps	2 x $\frac{3}{8}$ x 0 8	3
	1	1	2	" eye bolt	1$\frac{1}{2}$ x $\frac{1}{2}$ x 0 4$\frac{1}{2}$	2
			2	" " " staples	$\frac{3}{4}$ x 0 6)	
			2	" pins	$\frac{3}{4}$ x 0 4	1
			2	" " chain staples	$\frac{1}{4}$ x2$\frac{1}{2}$)	
			2	Chafing strap for lever	1 x $\frac{1}{8}$ 1 0	1
						117

MOORE DOOR.—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
1	1	1	14	Track to plate, C. S. H.	$\frac{1}{4}$″x $6\frac{1}{4}$″	5
1	1	1	2	Stop to girth, B. H.	$\frac{1}{4}$ x $6\frac{1}{4}$	1
		1	16	Hangers to door	$\frac{3}{8}$ x $3\frac{3}{8}$	2
1	1	1	8	Hood block to plate, B. H.	$\frac{1}{2}$ x $9\frac{5}{8}$	4
1	1	1	12	Brackets to sill	$\frac{1}{2}$ x 9	9
1	1	1	6	" "	$\frac{1}{2}$ x $9\frac{1}{2}$	5
1			6	Closed stop to post, lag	$\frac{1}{4}$ x $6\frac{1}{4}$	2
			2	Safety lags, "	$\frac{1}{2}$ x $6\frac{1}{2}$	1
		1	4	Guide M to door, C. B.	$\frac{3}{8}$ x 3	1
		1	4	Guide L to door, "	$\frac{3}{8}$ x 3	1
		1	4	Guide H to door, "	$\frac{3}{8}$ x 3	1
						32
					Forgings....	117
						149

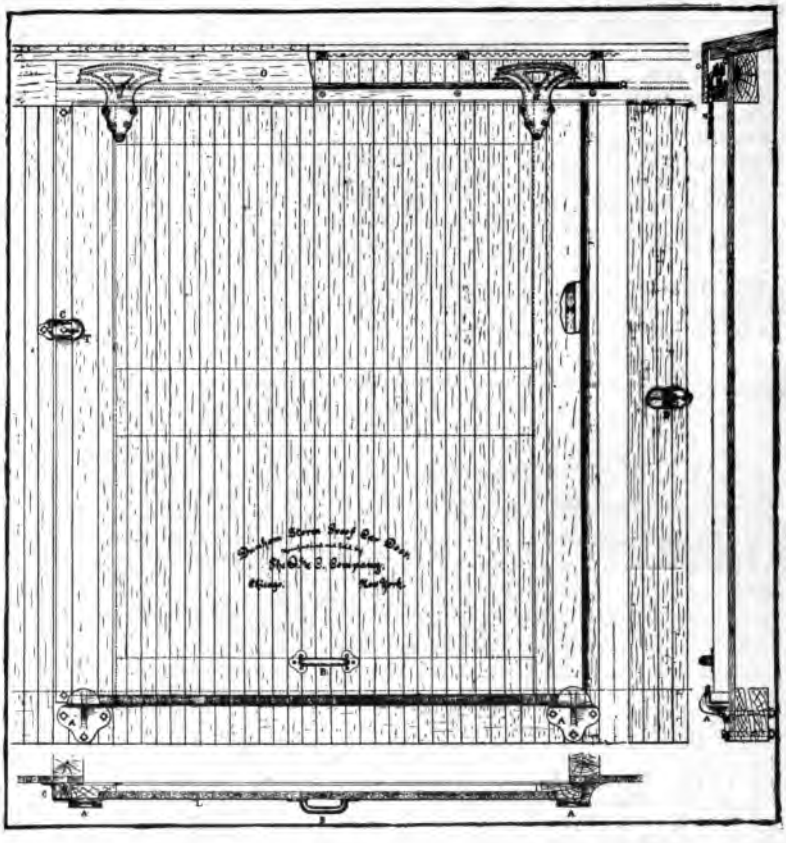
MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
	Moore car door fixtures complete for two side doors, 5′ opening, including: 4 Hangers, A; 4 Roller arm bearings, C; 4 Rollers, D; 2 Levers, E; 2 Levers, F, I and J; 2 Guides, upper, H; 2 Guides, center, L; 2 Lever guides, M; 2 Malleable burglar-proof brackets, B. P.; bolts connecting hanger brackets to top lever, C; connecting rod E to top lever C; connecting rod E, handle F, and center bolt K, all as furnished by the Moore Car Door Company, of Chicago, Ill.		
	Nails:		
	Fascia to plate	40d cut.	4
	Sheathing to batten and braces	6d clinch.	$3\frac{1}{2}$
	Door hood and spark strip	8d cut.	1
			$8\frac{1}{2}$
	Flat head iron wood screws:		
24	Threshold	$1\frac{3}{4}$″ No. 16.	
22	Chafing plate to bottom of door	$1\frac{1}{2}$ " 12.	
8	Lever chafing strip to door	$1\frac{1}{2}$ " 12.	
54			
2	Door pin chains	No. 0 x9″	
28	U. S. standard square nuts	For $\frac{3}{8}$″ bolt.	1
24	" " " "	" $\frac{1}{2}$ "	2
18	" " " "	" $\frac{5}{8}$ "	3
			6
30	Wrought iron washers	For $\frac{1}{2}$″ bolt.	1
18	" " "	" $\frac{5}{8}$ "	1
			2

THE MOORE DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
67	feet.	Lumber, pine stiles, rails, etc.		
88	"	pine sheathing.....		
34	"	" fascia, stops, etc.		
14	"	oak.....		
203	"			
155	"	Kiln drying.....		
38½	lbs.	Castings, gray iron.....		
149	"	Wrought iron		
		Moore door fixtures for two doors		
3½	"	Nails, 6d clinch.....		
5	"	" cut		
54		Wood screws		
1½	feet.	Chain		
6	lbs.	Square nuts.....		
2	"	Wrought washers		
		Labor:		
		Lumber yard.		
		Mill.		
		Blacksmith		
		Iron machine.....		
		Bolt room.....		
		Car builders.....		
		General labor.....		
		" expense.		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense.....		


Storm Proof Car Door
Elmira
New York

DUNHAM DOOR.

Complete Bill of all Materials Necessary to Apply Dunham Door to Car. (Two Side Doors, 5 ft. opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
2	Top rails	Pine..	$\frac{7}{8}$" x 7$\frac{3}{4}$" x 5′ 3"	1 "x 8 "x 6′ 0"	8′
2	Center rails	"	$\frac{7}{8}$ x 7$\frac{3}{4}$ x 5 3	1 x 8 x 6 0	8
2	Bottom rails	"	$\frac{7}{8}$ x 9$\frac{1}{2}$ x 5 3	1 x10 x 6 0	10
8	Stiles	"	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 2 4$\frac{3}{8}$	1 x 6 x 2 6	10
4	Braces	"	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 3 2$\frac{1}{2}$	1 x 6 x 3 6	7
25	Sheathing	"	$\frac{13}{16}$x 5$\frac{1}{4}$ x 6 10	1 x 6 x 7 0	88
2	Top track	Oak..	1$\frac{1}{2}$ x 1$\frac{3}{4}$ x10 8	1$\frac{3}{4}$ x 2 x10 9	6
2	Closed door stops	"	2$\frac{1}{8}$ x 2$\frac{1}{8}$ x 7 3	2$\frac{1}{4}$ x 2$\frac{3}{4}$ x 7 6	8
2	Headers	Pine..	$\frac{7}{8}$ x 4$\frac{5}{8}$ x 5 0	1 x 6 x 5 0	5
2	Side fascia	"	1$\frac{3}{4}$ x 3$\frac{3}{4}$ x14 3	2 x 4 x16 0	21
2	" "	"	1$\frac{3}{4}$ x 3$\frac{5}{8}$ x 9 6	2 x 4 x10 0	13
4	Hood blocks	Oak..	4$\frac{1}{4}$ x 7$\frac{1}{4}$ x 0 7	4$\frac{1}{2}$ x 7$\frac{1}{2}$ x 0 9	8
2	Hoods	Pine..	$\frac{7}{8}$ x 7$\frac{1}{4}$ x10 8	1 x 8 x12 0	16
4	Wedge on door	Oak..	1$\frac{1}{2}$ x1 x 1 0	Cuttings.....	
					308′

CASTINGS.

Pcs.	Description.	Mat'ls.	Wt.
4	Bottom brackets	Gray Iron ..	28$\frac{1}{2}$
2	Handles	" " ..	6
			34$\frac{1}{2}$

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3$\frac{1}{2}$" x $\frac{1}{4}$" x 5′ 0"	29
			2	Plates on bottom edge	1$\frac{1}{2}$ x $\frac{1}{8}$ x 5 8$\frac{1}{2}$	7
			2	" on side of car	1 x $\frac{1}{8}$ x 5 $\frac{1}{2}$	4
			2	Joint strip edge of door	2 x $\frac{1}{4}$ x 6 10	23
			2	" " door post	1 x $\frac{1}{4}$ x 6 10	11
			2	Hasps	2 x $\frac{5}{8}$ x 0 8	3
	1	1	2	" eye bolts	1$\frac{1}{2}$ x $\frac{5}{8}$ x 0 4$\frac{1}{2}$	2
			2	" staples	$\frac{5}{8}$ x 0 6	1
			2	" pins	$\frac{5}{8}$ x 0 4	
			2	" " chain staple	$\frac{1}{8}$ x 0 2$\frac{1}{2}$	
						80

DUNHAM DOOR—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	14	Track to plate, B. H.	½″x 7½″	6
	1	1	2	Open stops to girth, B. H.	½ x 5⅞	1
	1	1	8	Hood block to plate, C. B.	½ x 9½	4
	1		4	Closed wood stop to post, lag	½ x 6¼	1
			2	Open stops to girth, "	½ x 4¼	1
	1	1	12	Bracket to sill	⅝ x 9¼	9
	1	2	4	Tie rods	⅜ x5′ 4⅜	8
						30
					Forgings	80
						110

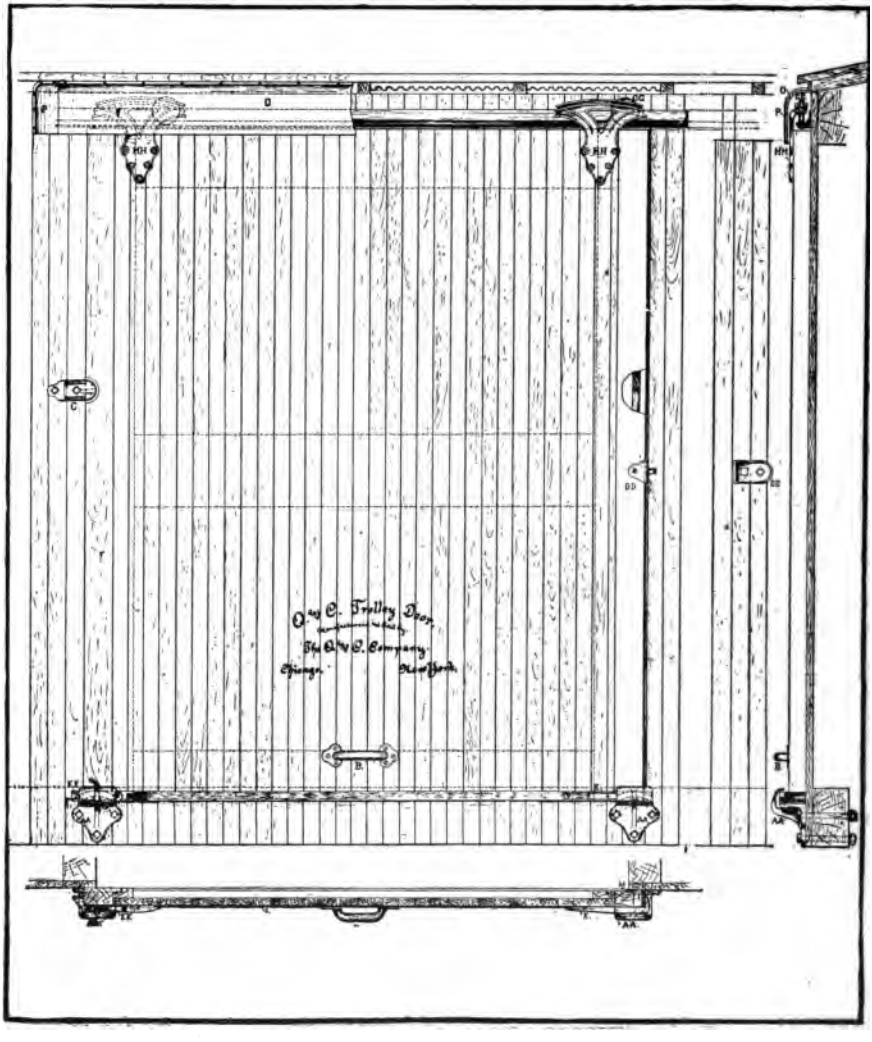
MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
	Dunham car door fixtures complete for two side doors, 5′ opening, including— 4 Hangers H, 4 Wheels G, 2 Lips C. 2 Stops D or D D. Sufficient track for two doors up to 11 feet. All as supplied by tho Q. & C. Company, of Chicago, Ill.		
	Nails:		
	Wedges to bottom of door	2″ No. 12, B.W.	¼
	Metal track to wood track	1 " 10, "	¾
	Sheathing to braces, rails and stiles	6 d clinch	3½
	Fascia to plate	40 d cut	4
	Hood to blocks and roof	8 d "	1
			9½
	Flat Head Iron Wood Screws:		
24	For door threshold	1¾″ No. 16	
18	" bottom plate	1½ " 14	
20	" joint strips on door	2 " 14	
14	" plates on side of car	1¼ " 14	
12	" handles	1¾ " 16	
20	" hangers	1¾ " 20	
20	" joint strips on post	1½ " 16	
128			
2	Door hasp pin chain	No. 0 x 9″	
8	U. S. Standard square nuts	For ⅜″ bolt	1
28	" " " "	" ½ "	2
12	" " " "	" ⅝ "	2
			5
4	Wrought washers	For ⅜″ bolt	1
34	" "	" ½ "	1
12	" "	" ⅝ "	1
			3

DUNHAM DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price	Am'nt.
48	feet.	Lumber, pine, door rails, etc.		
16	"	Pine, door hood		
88	"	" " sheathing		
34	"	" fascia		
22	"	Oak		
208	"			
152	feet.	Kiln drying		
34½	lbs.	Castings, gray iron		
110	"	Wrought iron		
1	set.	Dunham door fixtures for two doors		
128		Wood screws		
1	lb.	B. W. nails		
3½	"	Clinch "		
5	"	Cut "		
5	"	Square nuts		
3	"	Wrought washers		
1½	feet.	Chain		
		Labor.		
		Lumber yard		
		Mill		
		Blacksmith		
		Iron machine		
		Bolt room		
		Car builders		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		



Q & C. TROLLEY DOOR.

Complete Bill of all Materials Necessary to Apply Q. & C. Door to Car.

(Two Side Doors, 5′ Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
2	Top rails	Pine	7/8″x7¾″x 5′ 3″	1″ x 8″ x 6′ 0″	8′
2	Center rails	"	7/8 x7¾ x 5 3	1 x 8 x 6 0	8
2	Bottom "	"	7/8 x9¾ x 5 3	1 x10 x 6 0	10
8	Stiles	"	7/8 x5¾ x 2 4⅜	1 x 6 x 2 6	10
4	Braces	"	7/8 x5¾ x 3 2½	1 x 6 x 3 6	7
25	Sheathing	"	13/16 x5¼ x 6 10	1 x 6 x 7 0	88
2	Closed stops	Oak	2⅛ x2½ x 7 3	2¼ x 2¾ x 7 6	8
2	Header	Pine	¾ x4¾ x 5 0	1 x 6 x 5 0	5
2	Side Fascia	"	1¾ x3¾ x14 3	2 x 4 x16 0	21
2	" "	"	1¾ x3¾ x 9 6	2 x 4 x10 0	13
4	Hood blocks	Oak	4¼ x7¼ x 0 7	4½ x 7½ x 0 9	8
2	Hoods	Pine	⅞ x7¼ x10 8	1 x 8 x12 0	16
					202′

CASTINGS.

Pcs.	Description.	Mat'ls.	Weight
4	Bottom brackets	Gray iron	28½
2	Handles	" "	6
			34½

FORGINGS.

C. W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
		2	Thresholds	3½″x ¼″x 5′ 0″	29
		2	Plates on bottom edge	1½ x ⅛ x 5 8¼	7
		2	" " side of car	1 x ⅛ x 5 ½	4
		2	Joint strips on edge of door	2 x ¼ x 6 10	23
		2	" " " post	1 x ¼ x 6 10	11
		2	Hasps	2 x ⅜ x 0 8	3
1	1	2	" eye-bolt	1½ x ½ x 0 4½	2
		2	" staples	⅜ x 0 6	1
		2	" pins	½ x 0 4	
		2	" " staples	⅛ x 2½	
					80

Q. & C. TROLLEY DOOR.—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	2	Open stops to girth, B. H	$\frac{1}{2}$″ x 0′ 5$\frac{7}{8}$″ ..	1
			2	" " " " lag	$\frac{1}{2}$ x 0 4$\frac{1}{2}$ ..	1
	1	1	8	Hood block to plate, C. B	$\frac{1}{2}$ x 0 9$\frac{1}{2}$ ..	4
	1		4	Closed wood stops to post, lags	$\frac{1}{2}$ x 0 6$\frac{1}{2}$ ..	1
	1	1	2	" malleable stops to post	$\frac{1}{2}$ x 0 8$\frac{1}{2}$ ..	1
	1	1	12	Brackets to sill	$\frac{3}{8}$ x 0 9$\frac{1}{2}$ ..	9
	1	2	4	Tie rods	$\frac{3}{8}$ x 5 4$\frac{3}{8}$ ..	8
						25
					Forgings....	80
						105

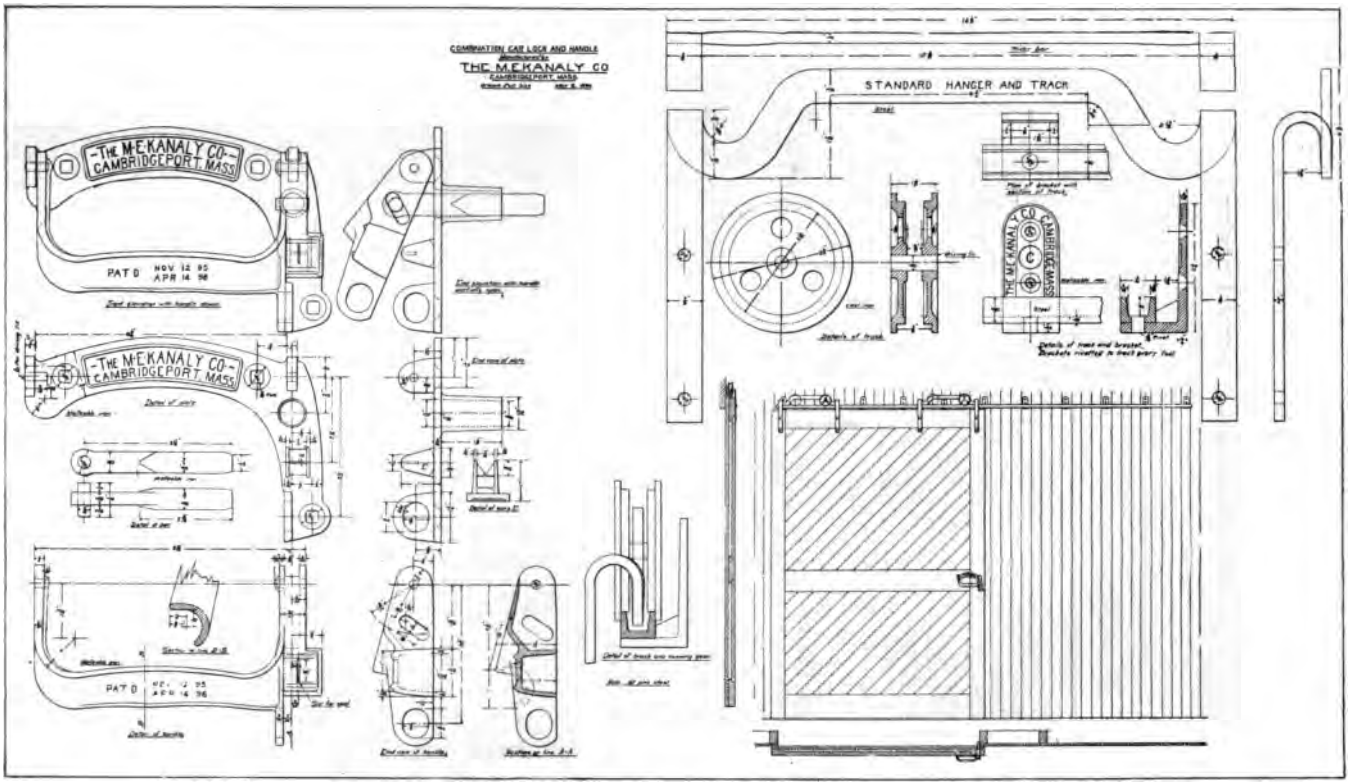
MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
	Q. & C. Trolley Door Fixtures complete, for two side doors, 5′ opening, including: 4 hangers, H. H.; 4 wheels, G. G.; 2 pieces track up to 11 feet; 8 track brackets, B; 2 stops, D. or D. D., all as furnished by the Q. & C. Company, of Chicago, Ill.		
	Nails:		
178	Wedges to door	2″ No. 12	$\frac{3}{4}$
	Sheathing to rails, stiles and braces	6d clinch.	3$\frac{1}{2}$
	Fascia to plate	40d cut.	4
	Hood to blocks and roof	8d "	1
			9$\frac{1}{4}$
2	Door hasp pin chain	No. 0 x 9″	
	Flat head iron wood screws:		
2	For closed malleable stops	1$\frac{1}{4}$″ No. 20	
24	" thresholds	1$\frac{3}{4}$ " 16	
18	" bottom plates	1$\frac{1}{2}$ " 14	
20	" joint strips on door	2 " 14	
20	" " " " post	1$\frac{1}{2}$ " 16	
12	" handles	1$\frac{3}{4}$ " 16	
20	" hangers	1$\frac{3}{4}$ " 20	
24	" track brackets	1$\frac{1}{4}$ " 12	
24	" track to car	2$\frac{1}{2}$ " 17	
14	" plates to side of car	1$\frac{1}{4}$ " 14	
178			
8	U. S. standard square nuts	For $\frac{3}{8}$″ bolt.	1
14	" " " "	" $\frac{1}{2}$ "	1
12	" " " "	" $\frac{5}{8}$ "	2
			4
4	Wrought washers	For $\frac{3}{8}$″ bolt.	1
18	" "	" $\frac{1}{2}$ "	1
12	" "	" $\frac{5}{8}$ "	1
			3

Q. & C. TROLLEY DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
48	feet.	Lumber, pine, door rails, etc.			
16	"	" hood			
88	"	" sheathing			
34	"	" fascia			
16	"	Oak			
202	feet.				
152	feet.	Kiln drying			
34½	lbs.	Castings			
105	"	Wrought iron			
1	set.	Q. & C. Trolley Door Fixtures			
1½	feet.	Chain			
178		Wood screws			
4½	lbs.	Nails, clinch and B. W			
5	"	" cut			
4	"	Square nuts			
3	"	Wrought washers			
		Labor :			
		Lumber yard			
		Mill			
		Blacksmith			
		Iron machine			
		Bolt room			
		Car builders			
		General labor			
		" expense			
		RECAPITULATION.			
		Materials			
		Labor			
		General expense			


COMBINATION CAR LOCK AND HANDLE
THE M.E.KANALY CO
CAMBRIDGEPORT MASS.
STANDARD HANGER AND TRACK
THE M.E.KANALY CO
CAMBRIDGEPORT MASS
PAT'D NOV 12 95
APR 14 96

KANALY SIDE DOOR.

Complete Bill of all Materials Necessary to Apply Kanaly Door to Car.

(Two Side Doors, 5-foot Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
2	Top rails	Pine.	$\frac{7}{8}$" x 7¼"x 5′ 3"	1 "x 8"x 6′ 0"	8′
2	Center rails	"	$\frac{7}{8}$ x 7¼ x 5 3	1 x 8 x 6 0	8
2	Bottom rails	"	$\frac{7}{8}$ x 9¼ x 5 3	1 x10 x 6 0	10
8	Stiles	"	$\frac{7}{8}$ x 5¼ x 2 4⅜	1 x 6 x 2 6	10
4	Braces	"	$\frac{7}{8}$ x 5¼ x 3 2½	1 x 6 x 3 6	7
25	Sheathing	"	$\frac{13}{16}$ x 5½ x 6 10	1 x 6 x 7 0	88
2	Closed stops	Oak.	2⅛ x 2½ x 7 3	2¼ x 2¾x 7 6	8
2	Headers	Pine.	¾ x 4¼ x 5 0	1 x 6 x 5 0	5
4	Wedge blocks	Oak.		Cuttings.	
2	Side fascia	Pine.	1¼ x 3¾ x14 3	2 x 4 x16 0	21
2	" "	"	1¼ x 3¾ x 9 6	2 x 4 x10 0	13
4	Hood blocks	Oak.	4½ x 7½ x 0 7	4½ x 7½x 0 9	8
2	Hoods	Pine.	⅞ x 7½ x10 8	1 x 8 x12 0	16
					202′

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Wt.
4	.....	Sill Brackets	Gray Iron.	28½
2	.....	Open Stops	" "	10
				38½

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3½"x ¼" x 5′ 0"	29
			2	Chafing strip, bottom of door	1½ x 3/16 x 5 6	10
						39

KANALY SIDE DOOR—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	2	Stop to girth, B. H.	$\frac{1}{2}$" x0' $6\frac{5}{8}$" ..	1
	1	1	16	Hanger to door	$\frac{5}{16}$ x0 3 ...	1
	1	1	8	Hood block to plate, B. H.	$\frac{1}{2}$ x0 $9\frac{5}{8}$ ...	4
	1	1	12	Bracket to sill.	$\frac{5}{8}$ x0 9	9
	1		6	Closed door stop to post, lag	$\frac{1}{2}$ x0 $6\frac{1}{4}$	2
						17
					Forgings	39
						56

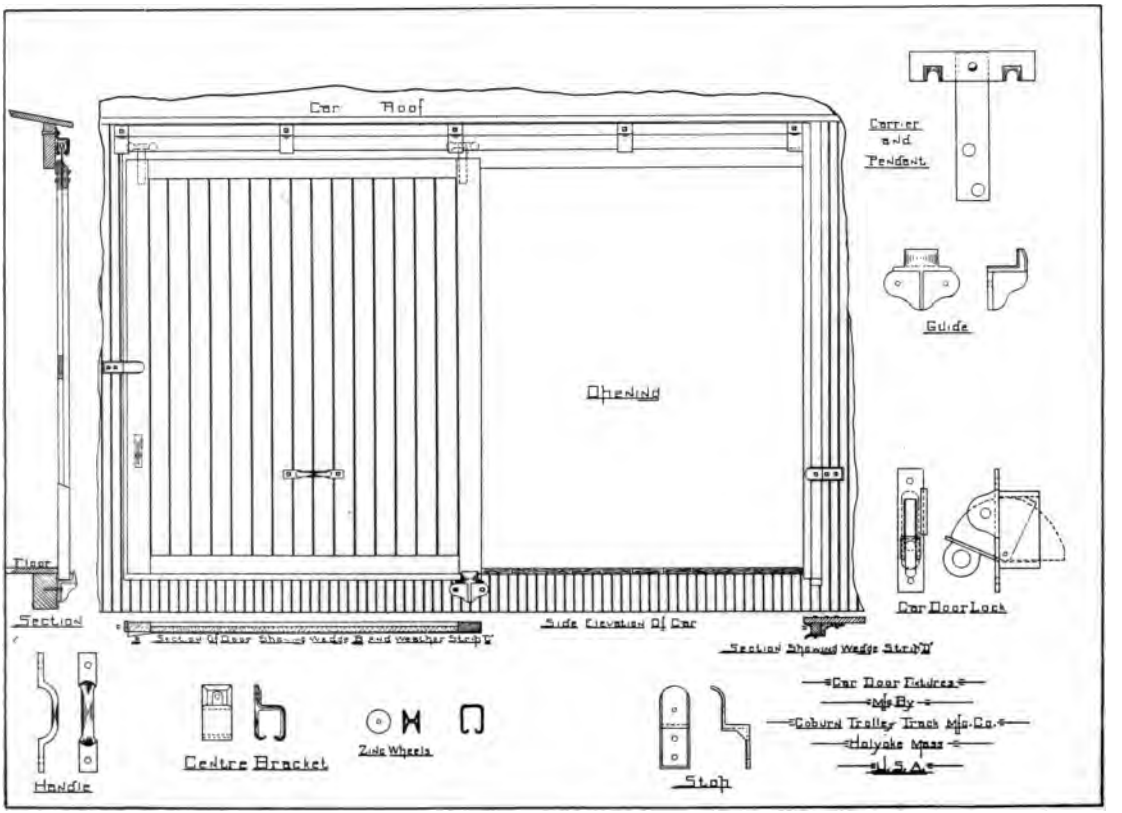
MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
	The M. E. Kanaly Door Fixtures, complete for two side doors, 5′ 0″ opening, including:		
	4 Hangers,		
	4 Wheels,		
	2 Tracks, (with 9 brackets each riveted to them.)		
	2 Seal Locks complete, including bolts for attaching same.		
	All as supplied by the M. E. Kanaly Company, of Cambridgeport, Mass.		
	Nails:		
	Fascia to plate	40 d cut....	4
	Sheathing to battens and braces.	6 d clinch..	$3\frac{1}{2}$
	Door hood and spark strip	8 d cut....	1
			$8\frac{1}{2}$
	Flat Head Iron Wood Screws:		
24	Threshold.	$1\frac{3}{4}$" No. 16,	
22	Chafing plate to bottom of door.	$1\frac{1}{2}$ " 12,	
36	Track bracket to car	2 " 14,	
82			
16	U. S. Standard Square Nuts	For $\frac{5}{16}$"bolt	1
10	" " " "	" $\frac{1}{2}$ "	1
12	" " " "	" $\frac{5}{8}$ "	2
			4
16	Wrought washers	For $\frac{5}{16}$"bolt	1
16	" "	" $\frac{1}{2}$ "	1
12	" "	" $\frac{5}{8}$ "	1
			3

KANALY SIDE DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
48	feet.	Lumber, pine stiles, rails, etc.,			
16	"	pine door hoods			
88	"	" sheathing			
34	"	" fascia			
16	"	oak			
202	"				
152	"	Kiln drying			
38½	lbs.	Castings, gray iron			
56	"	Wrought iron			
		Kanaly door fixtures for two doors			
5	"	Nails, cut			
3½	"	" clinch			
82		Wood screws			
4	"	Square nuts			
3	"	Wrought washers			
		Labor:			
		Lumber yard			
		Mill			
		Blacksmith			
		Iron machine			
		Bolt room			
		Car builders			
		General labor			
		" expense			
		RECAPITULATION.			
		Materials			
		Labor			
		General expense			


Car Roof
Carrier and Pendant
Guide
Opening
Floor
Section
Side Elevation Of Car
Car Door Lock
Section Showing Wedge Strip "W"
Handle
Centre Bracket
Side Wheels
Stop
Car Door Fixtures
Mfd By
Coburn Trolley Track Mfg. Co.
Holyoke Mass
U.S.A.

COBURN DOOR.

Complete Bill of all Materials Necessary to Apply Coburn Door to a Car.

(Two Side Doors, 5 Foot Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
2	Top rails	Pine	7/8" x 7 3/4" x 5' 3"	1" x 8 " x 6' 0"	8'
2	Center rails	"	7/8 x 7 3/4 x 5 3	1 x 8 x 6 0	8
2	Bottom "	"	7/8 x 9 3/4 x 5 3	1 x10 x 6 0	10
8	Stiles	"	7/8 x 5 3/4 x 2 4 3/8	1 x 6 x 2 6	10
4	Braces	"	7/8 x 5 3/4 x 3 2 1/2	1 x 6 x 3 3	7
25	Sheathing	"	13/16 x 5 1/4 x 6 10	1 x 6 x 7 0	88
2	Closed stops	Oak	2 1/8 x 2 1/2 x 7 3	2 1/4 x 2 3/4 x 7 6	8
2	Headers	Pine	3/4 x 4 3/4 x 5 0	1 x 6 x 5 0	5
2	Weather strips	Oak	3/8 x 2 1/4 x 6 10	1 x 2 1/2 x 7 0	3
4	Wedge blocks	"		Cuttings.	
2	Side fascia	Pine	1 3/4 x 3 3/4 x14 3	2 x 4 x16 0	21
2	" "	"	1 3/4 x 3 3/4 x 9 6	2 x 4 x10 0	13
4	Hood blocks	Oak	4 1/4 x 7 1/4 x 0 7	4 1/2 x 7 1/2 x 0 9	8
2	Hoods	Pine	7/8 x 7 1/4 x10 8	1 x 8 x12 0	16
					205'

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Wt.
2		Bottom guides	Gray iron	14 1/4
2		Handles	" "	6
				20 1/4
2		Open stops	Malleable iron	3
2		Closed "	" "	3
				6

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3 1/2" x 1/4" x 5' 0"	29
			2	Plates on bottom edge	1 1/2 x 1/8 x 5 8 1/4	7
			2	" " side of car	1 x 1/8 x 5 0 1/2	4
			2	Hasps	2 x 3/8 x 0 8	3
1	1		2	" eye-bolts	1 1/2 x 1/2 x 0 4 1/2	2
			2	" staples	3/8 x 0 6	1
			2	" pins	1/2 x 0 4	
			2	" " chain staples	1/8 x 2 1/2	
						46

COBURN DOOR—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
1	1		10	Track and bracket to plate, B. H.	½"x 5¾"	3
1	1		2	Open stops to girth	½ x 5⅞	1
1	1		8	Hood block to plate	½ x 9½	4
1			4	Closed wood stop to Post, lag	½ x 6¼	1
1	1		2	" malleable " " "	½ x 8½	1
			2	Open " " " girth, lag	½ x 4¼	1
1	1		6	Brackets and sills	⅝ x 9¼	5
1	1		8	Hangers and doors, B. H.	½ x 3¼	1
						17
					Forgings...	46
						63

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	Coburn Trolley Track Fixtures complete for two doors, 5′ opening, including 4 hangers, 8 rollers, track and track brackets, all as supplied by the Coburn Trolley Track Mfg. Co., of Holyoke, Mass.		
	Nails:		
	Wedge to door	2" No. 12, B.W.	¼
	Sheathing	6 d clinch.	3½
	Fascia	40 d cut.	4
	Hood	8d "	1
			8¾
	Flat Head Iron Wood Screws:		
24	For threshold	1¾" No. 16	
18	" bottom plates	1½ " 14	
20	" weather strips to door	2 " 14	
12	" Handles	1¾ " 16	
14	" plates to side of car	1¼ " 14	
2	" closed malleable stops to post	1¼ " 20	
90			
30	U. S. Standard square nuts	For ½" bolt	3
6	" " " "	" ⅝ "	1
			4
34	Wrought washers	For ½" bolt	1
6	" "	" ⅝ "	1
			2
2	Door pin chain	No. 0x9"	

COBURN DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
48	feet.	Lumber, pine, rails, etc		
16	"	pine, hood		
88	"	" sheathing		
34	"	" fascia		
19	"	oak		
205	"			
152	"	Kiln drying		
20¼	lbs.	Castings, gray iron		
6	"	" malleable iron		
63	"	Wrought iron		
1	set.	Coburn door fixtures		
90		F. H. iron wood screws		
3¾	lbs.	Nails, B. W. and clinch		
5	"	" cut		
1½	feet.	Chain		
4	lbs.	Square nuts		
2	"	Wrought Washers		
		Labor:		
		Lumber yard		
		Mill		
		Blacksmith		
		Bolt room		
		Iron machine		
		Car builders		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

EUBANK STORM AND BURGLAR PROOF CAR DOOR

THE NATIONAL MALLEABLE CASTING COMPANY.
CHICAGO CLEVELAND TOLEDO INDIANAPOLIS.
PAT. 1905.

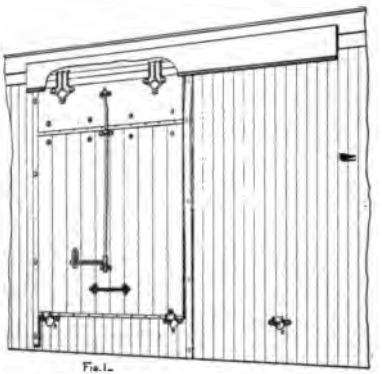


FIG. 1.

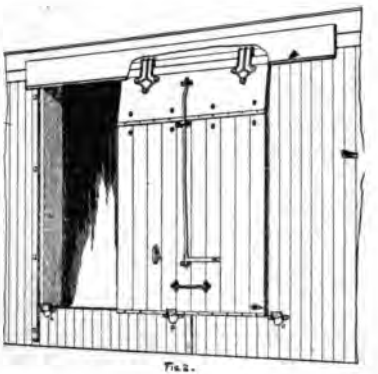
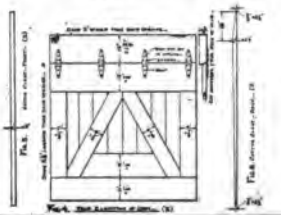
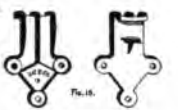


FIG. 2.

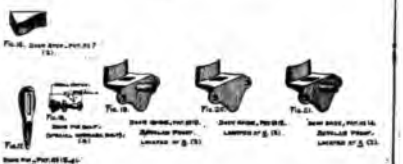
FIG. 3.





ALL PARTS MALLEABLE IRON NOT
OTHERWISE NOTED, MALLEABLE IRON CASTINGS.

THE NUMBER IN BRACKET [ ] GIVES THE
NUMBER OF PIECES REQUIRED FOR ONE TWO-DOOR CAR.



EUBANK DOOR.

Complete Bill of all Materials Necessary to Apply the Eubank Door to Car.

(Two Side Doors, 5-Foot Opening.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M
2	Top Rails	Pine.	1¾″ x 9¾″ x 5′ 2″	2 ″x10 ″ x 6 ′ 0″	20
2	" "	"	⅞ x11½ x 5 2	1 x12 x 6 0	12
2	Bottom Rails	"	⅞ x 9¾ x 5 2	1 x10 x 6 0	10
4	Stiles	"	⅞ x 7 x 4 2¾	1 x 8 x 4 6	12
4	Braces	"	⅞ x 5¾ x	1 x 6 x 5 0	10
2	Handle battens	"	⅞ x 9¼ x	1 x10 x 3 0	5
25	Sheathing	"	13/16 x 5½ x 6 ¼	1 x 6 x 7 0	88
2	Top track furring	Oak.	1½ x 3 x10 8	1¾ x 3½ x11 0	10
2	Closed Stops	"	2⅛ x 2½ x 7 3	2¼ x 2¾ x 7 6	8
2	Headers	Pine.	1½ x 4¾ x 5 0	2 x 6 x 5 0	10
2	Guards	Oak.	2 x 2½ x 7 3	2¼ x 2¾ x 7 6	8
2	Side fascia	Pine.	1¾ x 3¾ x14 3	2 x 4 x16 0	21
2	" "	"	1¾ x 3¾ x 9 6	2 x 4 x10 0	13
2	Door hoods	"	⅞ x 7¼ x10 8	1 x 8 x12 0	16
4	Door hood blocks	Oak.	4¼ x 7¼ x 0 7	4½ x 7½ x 0 9	8
					251′

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3½″x ¼″x 5′ 0″..	29
			2	Top track	2 x ½ x10 8 ..	71
			2	Strips at break in door	2 x 1/16 x 5 2 ..	4
			2	" " bottom of door	2 x ⅛ x 5 6 ..	9
			2	Friction plates on door cleats	2 x ⅛ x 0 4 ..	1
			2	" " " back of door	1½ x ⅛ x 4 11 ..	6
						120

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	12	Eccentric castings	⅜″x 0′ 3 ″	1
	1	1	12	Guides to sills	⅜ x 0 8¾	6
	1	1	2	Open stop to girth, B. H	⅜ x 0 6¾	1
Total.	4	1	12	Hangers to door	⅜ x 0 3¾	3
	1	1	14	Track to plates, C. S. H	⅜ x 0 6¼	5
	1	1	8	Hood block to plate, B. H	⅜ x 0 9¾	4
	1		8	Closed stop to post	⅜ x 0 6¼	3
	1	1	4	Seal pin keepers, B. H	⅜ x 0 3	1
	1	1	10	Door guards to car, B. H	½ x 7 avg....	4
						28
					Forgings	120
						148

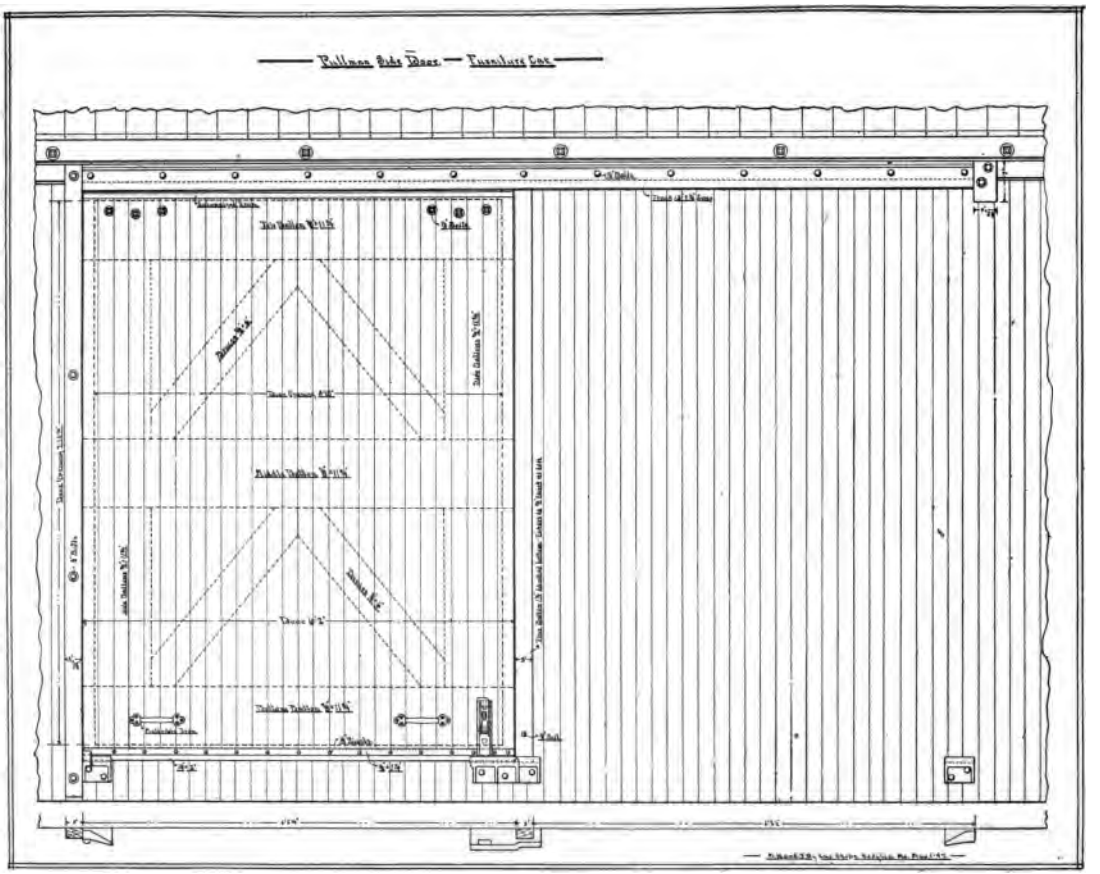
EUBANK DOOR.—(Continued.)

MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
	Eubank car door fixtures complete for two doors, 5′ 0″ opening, including:		
2	Malleable iron door open stops	No. 7	
2	" " center eccentric rod castings	" 8	
2	" " bottom " " "	" 9	
2	" " top " " "	" 10	
4	" " hangers	" 13	
2	" " open door guides	" 12	
2	" " front door guides	" 14	
2	" " back " "	" 19	
2	" " door pins	" 15	
2	" " eccentric rod levers	" 16	
2	" " door handles	" 17	
2	" " door pin keepers	" 188	
2	Wrought iron eccentric rods	" 20	
4 prs	Strap hinges	6″	
4	Bolts for door pins (special)	No. 22	
	All as supplied by the National Malleable Castings Company, of Chicago, Ill.:		
16	Stove bolts for hangers	$\frac{1}{4}$″ x 2$\frac{1}{4}$″	
	Flat head iron wood screws:		
20	Strips to door at break	1$\frac{1}{2}$″ No. 14	
22	" " " bottom	1$\frac{1}{2}$ " 14	
8	Friction plates on door	1$\frac{1}{2}$ " 14	
20	" " " back of door	1$\frac{1}{2}$ " 14	
48	Door hinges	1$\frac{1}{2}$ " 14	
24	Thresholds	1$\frac{1}{2}$ " 16	
12	Handles	1$\frac{1}{2}$ " 14	
2	Seal pin keepers	1$\frac{1}{2}$ " 14	
156			
	Nails:		
	Sheathing to batten and braces	6d clinch.	3
	Door hood	8d wire.	$\frac{1}{2}$
	Fascia to plate	40d cut.	5
16	U. S. Standard square nuts	For $\frac{3}{8}$″ bolt	1
58	" " " "	" $\frac{1}{2}$ "	5
			6
16	Wrought washers	For $\frac{3}{8}$″ bolt	1
58	" "	" $\frac{1}{2}$ "	2
16	" "	" $\frac{1}{4}$ "	
			3

SUMMARY.

Quantity.		Specifications.	Price	Am'nt.
49	feet.	Lumber, pine, stiles, rails, etc., 1"		
30	"	Pine, stiles, rails, etc., 2"		
88	"	" sheathing		
34	"	" fascia		
16	"	" door hood		
34	"	Oak		
251	"			
183	"	Kiln drying		
1	set.	Eubank door fixtures		
148	lbs.	Wrought iron		
16		Stove bolts		
156		F. H. iron wood screws		
3	"	Nails, clinch		
½	"	" wire		
5	"	" cut		
6	"	Square nuts		
3	"	Wrought washers		
		Labor:		
		Lumber yard		
		Mill		
		Blacksmith		
		Iron machine		
		Bolt room		
		Car builders		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		


Pullman Side Door. — Fuselage Cut.

THE A. B. PULLMAN DOOR.

Complete Bill of all Materials Necessary to Apply the A. B. Pullman Door to Car.

(Two Side Doors, 5-foot Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
2	Top rails	Pine.	$\frac{7}{8}$" x 7$\frac{3}{4}$"x 5′ 3"	1 "x 8 "x 6′ 0"	8′
2	Center rails	"	$\frac{7}{8}$ x 7$\frac{3}{4}$ x 5 3	1 x 8 x 6 0	8
2	Bottom rails	"	$\frac{7}{8}$ x 9$\frac{1}{4}$ x 5 3	1 x10 x 6 0	10
8	Stiles	"	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 2 4$\frac{3}{8}$	1 x 6 x 2 6	10
4	Braces	"	$\frac{7}{8}$ x 5$\frac{1}{4}$ x 3 2$\frac{1}{2}$	1 x 6 x 3 6	7
25	Sheathing	"	$\frac{13}{16}$ x 5$\frac{1}{4}$ x 6 10	1 x 6 x 7 0	88
2	Top track furring	Oak.	1$\frac{1}{2}$ x 3 x10 8	2 x 3$\frac{1}{4}$ x11 0	12
2	Closed stops	"	2$\frac{1}{8}$ x 2$\frac{1}{2}$ x 7 3	2$\frac{1}{4}$ x 2$\frac{3}{4}$ x 7 6	8
2	Headers	Pine.	$\frac{3}{4}$ x 4$\frac{3}{4}$ x 5 0	1 x 6 x 5 0	5
2	Guards	Oak.	1$\frac{3}{8}$ x 1$\frac{3}{4}$ x 7 3	(1$\frac{3}{4}$ x 2 x 7 6) 1	2
2	Side fascia	Pine.	1$\frac{1}{4}$ x 3$\frac{3}{4}$ x34 5$\frac{1}{8}$	2 x 4 x35 0	47
2	Stop blocks	Oak.	2$\frac{1}{2}$ x 4 x 0 7	2$\frac{3}{4}$ x 4$\frac{1}{4}$ x 0 9	2
					207′

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Wt.
4	.....	Handles	Gray Iron.	12
2	.....	Open stops	" "	10
				22

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3$\frac{1}{2}$" x $\frac{1}{4}$"x 5′ 0"	29
			2	Bottom guide plates	2$\frac{1}{2}$ x $\frac{1}{4}$ x 5 3	22
			2	Bottom Chafing plates	1$\frac{1}{4}$ x $\frac{1}{8}$ x 5 3	5
						56

A. B. PULLMAN DOOR—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	14	Track to plate, B. H	½"x 6⅞"	5
	1	1	14	Brackets to sill, C. B	½ x 7½	6
		1	2	Stops to girth, B. H	½ x 6½	1
	1		8	" " post, lag	½ x 6¼	3
	1	1	12	Hangers to door, ctr. head	½ x 2¾	2
		1	2	Lock to door, ctr. head	7/16 x 2¾	1
	1	1	2	Door guards to door, B. H	½ x 7⅝	1
						19
					Forgings	56
						75

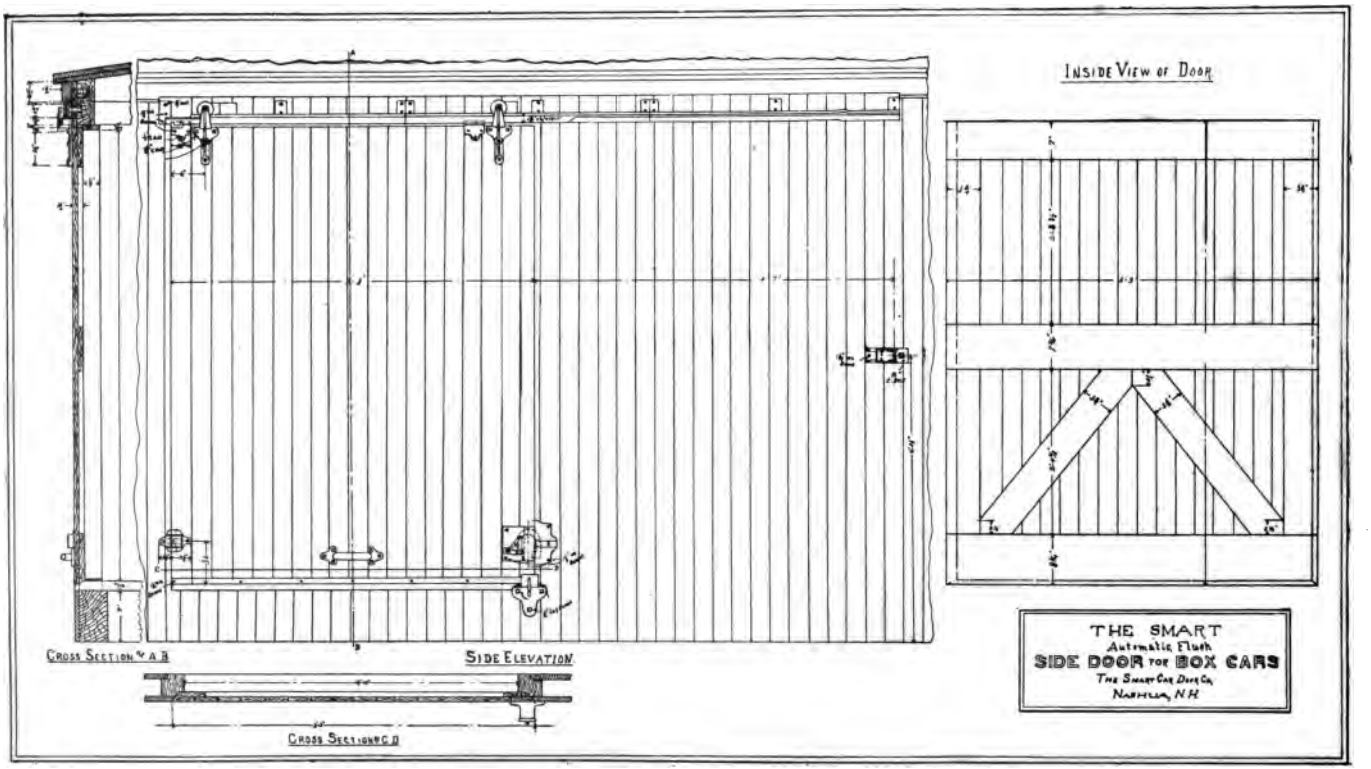
MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
20	B. H. rivets, iron plate to door	¼"x 2⅛"	
2	Galvanized iron to make weather strip on top of door	2¾ x5' 3	3¾
2 sets	A. B. Pullman fixtures complete, including— Track, 4 Hangers, 4 Balls, 2 Bottom guide castings, at closed stops, 2 Bottom guide castings, at open stops, 2 Bottom guide castings, center, 2 Locks, complete, All as supplied by the A. B. Pullman Co., of Chicago, Ill.		
	Nails:		
	Sheathing	6 d clinch.	3½
	Fascia to plate	40 d cut.	5
	Galvanized iron to door	1" No. 12, B. W.	¼
	Door guard to car	3 " 11, "	¼
			9
	Flat Head Iron Wood Screws:		
24	Door thresholds	1½" No. 16	
24	" handles	1½ " 16	
48			
44	U. S. Standard square nuts	For ½" bolt	3
2	" " " "	" 7/16 "	1
			4
50	Wrought washers	For ½" bolt	2

A. B. PULLMAN DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
88	feet.	Lumber, pine, sheathing			
48	"	Pine, rails, etc.....			
47	"	" fascia			
24	"	Oak.....			
207	"				
136	"	Kiln drying			
22	lbs.	Castings.....			
75	"	Wrought iron.....			
4	"	Nuts.....			
2	"	Washers.....			
48		F. H. iron wood screws....			
2	sets.	A. B. Pullman fixtures....			
3½	lbs.	Nails, clinch.....			
5	"	" cut			
½	"	" B. W			
20		R. H. rivets			
3¾	"	Galvanized iron.....			
		Labor:			
		Lumber yard.....			
		Mill			
		Blacksmith.....			
		Iron machine.....			
		Bolt room.....			
		Car builders.....			
		Tinners.....			
		General labor.....			
		" expense			
		RECAPITULATION.			
		Materials.....			
		Labor.....			
		General expense.....			


INSIDE VIEW OF DOOR
CROSS SECTION A B
SIDE ELEVATION
CROSS SECTION C D
THE SMART
Automatic Flush
SIDE DOOR FOR BOX CARS
THE SMART CAR DOOR CO.
NASHUA, N.H.

SMART AUTOMATIC FLUSH DOOR.

Complete Bill of all Materials Necessary to Apply the Smart Automatic Flush Side Door to Car.

(Two Doors, 5 Foot Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
2	Top rails.....	Pine	$\frac{7}{8}$"x 7" x 5' 5"	1"x 8"x 6' 0"	8'
2	Center rails...	"	$\frac{7}{8}$ x 7$\frac{3}{4}$ x 5 5	1 x 8 x 6 0	8
2	Bottom " ...	"	$\frac{7}{8}$ x 8$\frac{3}{4}$ x 5 5	1 x10 x 6 0	10
4	Stiles	"	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 2 4$\frac{3}{8}$	1 x 6 x 2 6	5
4	"	"	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 2 3$\frac{7}{8}$	1 x 6 x 2 6	5
4	Braces.....	"	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 3 2$\frac{1}{2}$	1 x 6 x 3 6	7
25	Sheathing	"	$\frac{13}{16}$ x 5$\frac{1}{4}$ x 6 7$\frac{3}{4}$	1 x 6 x 7 0	88
2	Headers.....	"	$\frac{3}{4}$ x 2$\frac{7}{8}$ x 5 0	1 x 3 x 5 0	3
2	Side fascia	"	1$\frac{3}{4}$ x 3$\frac{3}{4}$ x14 3	2 x 4 x16 0	21
2	" "	"	1$\frac{3}{4}$ x 3$\frac{3}{4}$ x 9 6	2 x 4 x10 0	13
4	Hood blocks..	Oak	5 x 7$\frac{1}{4}$ x 0 7	5$\frac{1}{2}$x 7$\frac{1}{2}$x 0 9	10
2	Hoods.....	Pine	$\frac{7}{8}$ x 7$\frac{1}{4}$ x10 8	1 x 8 x12 0	16
					194'

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l.	Wt.
2	.....	Sill brackets.....	Gray iron.....	14$\frac{1}{4}$
2	.....	Door handles.....	" "	6
				20$\frac{1}{4}$

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds.....	3$\frac{1}{2}$" x $\frac{1}{4}$" x 5' 0"	29
			2	Chafing strips, bottom door.....	1$\frac{1}{2}$ x$\frac{3}{16}$ x 5 5	10
						39

SMART AUTOMATIC FLUSH DOOR—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	18	Track to plates	$\frac{3}{8}$" x 0′ $7\frac{1}{4}$"	4
	1	1	2	Open stop to girth, B. H	$\frac{1}{2}$ x 0 $5\frac{7}{8}$	1
	1	1	8	Hood block to plate, C. B	$\frac{1}{2}$ x 0 $9\frac{1}{2}$	4
	1	1	6	Brackets to sills	$\frac{5}{8}$ x 0 $9\frac{1}{4}$	5
		1	2	Closed stop to door	$\frac{5}{8}$ x 0 $2\frac{1}{2}$	1
	1	1	2	" " " post	$\frac{1}{2}$ x 0 $6\frac{1}{2}$	
	1	1	16	Hangers to door, C. B	$\frac{1}{2}$ x 0 $2\frac{1}{2}$	2
	1	1	4	Top guide to door, C. B	$\frac{1}{4}$ x 0 $2\frac{1}{4}$	
						17

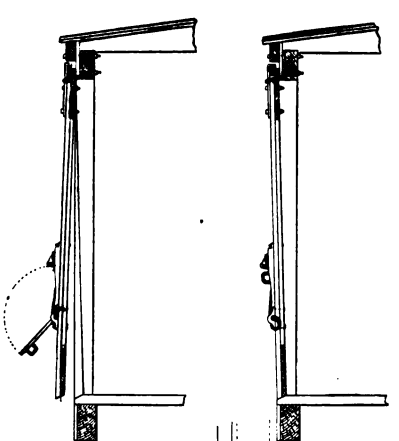
MISCELLANEOUS MATERIAL.

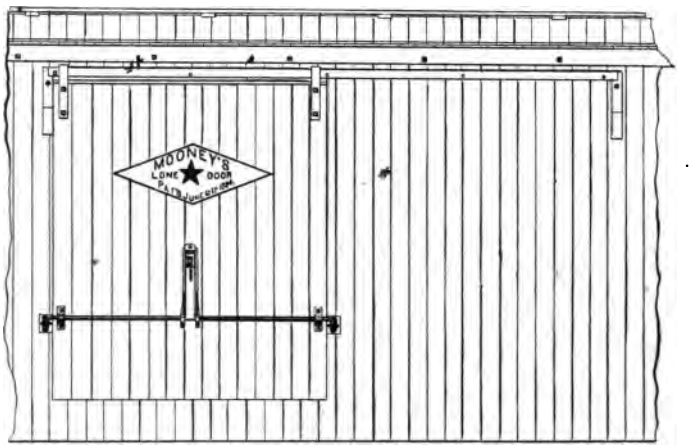
Per Car.	Description.	Size.	Wt.
	Smart Door Fixtures complete, for two side doors, 5′ 0″ opening, including: 4 hangers with rollers; 2 guides for top of door; 2 guides for top of door; track, with brackets for 2 doors (each made in three sections); 2 front stops, with lips and socket on front edge of door; 2 locks complete, with plate and jam, having a raised strip, which answers the same purpose as chafing strip on side of car; 2 open stops.		
	All as supplied by the Smart Car Door Co., Nashua, N. H.		
	Nails:		
	Sheathing to braces, rails and stiles	6d clinch.	$3\frac{1}{2}$
	Fascia to plate	40d cut.	4
	Hood to blocks and roof	8d cut.	1
	Flat head iron wood screws:		
20	Track to plates	$1\frac{3}{4}$" No. 16	
2	Open stops to girth	$1\frac{1}{2}$ " 16	
8	Top guide to door	$1\frac{3}{4}$ " 16	
4	Lock plates to post	$1\frac{1}{2}$ " 16	
6	" " " door	$1\frac{3}{4}$ " 16	
14	Chafing plate to bottom of door	$1\frac{1}{2}$ " 16	
12	Handles to door	$1\frac{3}{4}$ " 16	
24	Thresholds	$1\frac{1}{4}$ " 16	
90			
	Nuts and washers:		
4	U. S. standard square nuts	For $\frac{1}{4}$" bolt.	1
20	" " " "	" $\frac{3}{8}$ "	
28	" " " "	" $\frac{1}{2}$ "	2
			3
4	Wrought washers	For $\frac{1}{4}$" bolt.	1
20	" "	" $\frac{3}{8}$ "	
28	" "	" $\frac{1}{2}$ "	1
			2

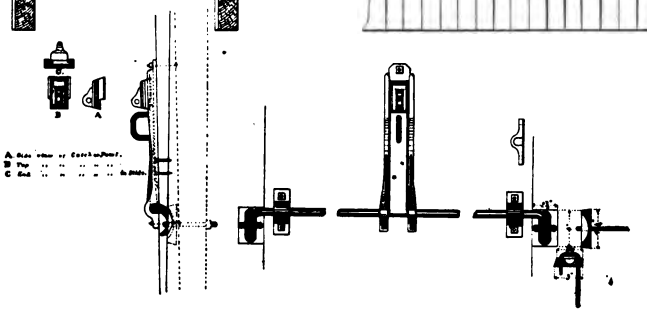
SMART AUTOMATIC FLUSH DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
46	feet.	Lumber, pine, rails, etc.....		
88	"	" sheathing.....		
34	"	" fascia.....		
16	"	" hoods.....		
10	"	oak, hood blocks....		
194	"			
150	feet.	Kiln drying.....		
20¼	lbs.	Castings, gray iron.....		
56	"	Wrought iron.....		
1	set.	Smart door fixtures.....		
3½	lbs.	Nails, 6 d clinch.....		
4	"	" 40 d cut.....		
1	"	" 8 d cut.....		
90		F. H. iron wood screws.....		
3	lbs.	Square nuts.....		
2	"	Wrought washers.....		
		Labor:		
		Lumber yard.....		
		Mill.....		
		Blacksmith.....		
		Iron machine.....		
		Bolt room.....		
		Car builder.....		
		General labor.....		
		" expense.....		
		RECAPITULATION.		
		Materials.....		
		Labor.....		
		General expense.....		







MOONEY'S
STORM AND SPARK PROOF
CAR DOOR
AND
FASTENING.

P.T. MOONEY.
Master Car Builder
Texas Central R.R.
Patentee

MOONEY'S LONE STAR CAR DOOR.

Complete Bill of all Materials Necessary to Apply Mooney's Lone Star Door to Car.

(Two Doors, 5-foot Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
2	Top rails	Pine.	7/8" x 7 3/4" x 5' 1"	1" x 8" x 6' 0"	8'
2	Center rails	"	7/8 x 7 3/4 x 5 1	1 x 8 x 6 0	8
2	Bottom rails	"	7/8 x 9 3/4 x 5 1	1 x10 x 6 0	10
8	Stiles	"	7/8 x 5 3/4 x	1 x 6 x 2 6	10
4	Braces	"	7/8 x 5 3/4 x	1 x 6 x 3 6	7
24	Sheathing	"	13/16 x 5 1/4 x	1 x 6 x 7 0	84
2	Top track furring	Oak.	1 1/2 x 1 1/2 x10 8	1 3/4 x 1 3/4 x11 0	6
2	Closed stops	"	2 1/8 x 2 1/2 x 1 3	2 1/2 x 2 3/4 x 1 6	2
2	Open stops	"	2 1/8 x 2 1/2 x 1 3	2 1/2 x 2 3/4 x 1 6	2
2	Door Caps	"	1 1/2 x 3 x 5 2	1 3/4 x 3 1/4 x 5 3	5
2	Headers	Pine.	3/4 x 4 3/4 x 5 0	1 x 6 x 5 0	5
2	Side fascia	"	1 3/4 x 3 3/4 x34 5 1/8	2 x 4 x35 0	47
					194'

CASTINGS.

Pcs.	Patterns.	Description.	Mat'l.	Wt.
4	.....	Rod guides on door (edges)	Gray Iron.	4
4	.....	" " " post	" "	10
2	.....	Lever guides on door (center)	" "	18
2	.....	Lever pawls	" "	3
2	.....	Sill brackets	" "	14
				49

FORGINGS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Thresholds	3 1/2" x 1/4" x 5' 0"	29
			2	Top tracks	2 x 1/2 x 10 8	71
			4	Hangers	2 x 1/2 x 1 1	14
			2	Door rods	1 x 5 9	30
			2	" " levers	2 x 3/8 x 1 8	8
			2	" " " handles	3/8 x 0 8	3
		1	4	" " guide hooks	1/2 x 0 10	
			4	" " " chafe irons	1 3/4 x 1/8 x 0 5	1
			2	" chafing strip at bottom	1 1/2 x 3/16 x 5 1	10
						166

MOONEY'S LONE STAR DOOR—(Continued.)

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	12	Track to plate, C. S. H.	$\frac{1}{2}$"x0' 8$\frac{1}{2}$" ...	6
	1	1	2	" " " "	$\frac{1}{2}$ x0 8$\frac{1}{2}$ ...	1
	1	1	8	Hangers to door	$\frac{1}{2}$ x0 4 ...	2
	1	1	8	Rod Guides to door, C. B.	$\frac{1}{2}$ x0 3$\frac{1}{2}$ ...	2
	1	1	4	Lever " " " "	$\frac{1}{2}$ x0 3$\frac{1}{2}$ ...	1
	1	1	2	" " " " "	$\frac{1}{2}$ x0 3$\frac{3}{8}$ } ...	
	1	1	2	Open stop to post	$\frac{1}{2}$ x0 7$\frac{1}{2}$ } ...	2
	1	1	2	Closed " " "	$\frac{1}{2}$ x0 8$\frac{1}{2}$ } ...	
						14
					Forgings	166
						180

MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
	Royalty for use of the Mooney Lone Star Car Door.....		
	Car builders to furnish all materials. P. T. Mooney, M. C. B., Texas Central R. R., patentee		
	Nails.		
	Stops to car.....	8d Cut	$\frac{1}{4}$
	Sheathing to stiles, rails and braces.....	6d Clinch....	3$\frac{1}{2}$
	Fascia to car	40d Cut.....	5
			8$\frac{3}{4}$
	Flat Head Iron Wood Screws.		
24	For thresholds.....	1$\frac{3}{4}$" No. 16....	
4	" lever guides to door	1$\frac{1}{2}$ No. 16....	
	Nuts and Washers.		
40	U. S. Standard square nuts.....	For $\frac{1}{2}$" bolt....	3
40	Wrought washers.....	" $\frac{1}{2}$ "	2

MOONEY'S LONE STAR DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
48	feet.	Lumber, pine, rails, etc.....		
84	"	" " sheathing.....		
47	"	" " fascia.....		
15	"	" oak.....		
194	"			
179	feet.	Kiln drying		
49		Castings, gray iron		
180	lbs.	Wrought iron.....		
		Royalty per car.....		
5	"	Nails, 40 d cut.....		
3½	"	" 6 d clinch.....		
¼	"	" 8 d cut.....		
28		F. H. iron wood screws.....		
3	lbs.	Square nuts		
2	"	Wrought Washers		
		Labor:		
		Lumber yard.....		
		Mill		
		Blacksmith.....		
		Iron machine.....		
		Bolt room.....		
		Car builders.....		
		General labor.....		
		" expense.....		
		RECAPITULATION.		
		Materials.....		
		Labor		
		Royalty.....		
		General expense.....		

CHAPTER IX.

GRAIN DOORS.

The principal difficulty experienced by the railroads with grain doors is the enormous expense of maintaining them, as in spite of the most diligent care and supervision they continue to be destroyed, torn off their fastenings, and lost beyond any reasonable expectation. The reduction of this expense has been the object of not only the master car-builders, but of many inventors in designing many different styles of grain doors, none of which are as yet considered perfectly satisfactory. However, illustrations and comparative bills of materials are shown of those that are apparently most popular, if one can judge by the number of the various designs that are in use.

Ordinary Grain Door.—The illustration presented shows the ordinary type of Grain Door upon which there is no patent, and differs from other unpatented Grain Doors in some of the details only.

Van Lew Flexible Grain Door.—This is one of the oldest types that is still in use, and differs from all others in so far as the principles involved in the construction is that of an ordinary roller-top desk.

It was impossible to obtain drawings for this device, but from the accompanying bill of material it should be noted that the usual center carline has been credited and the two carlines, one at each door post, have been increased in width to accommodate the framing necessary to allow the two doors to pass one another and slide under the roof between the two carlines referred to.

This door is applied on the royalty basis, the manufacturer furnishing all materials.

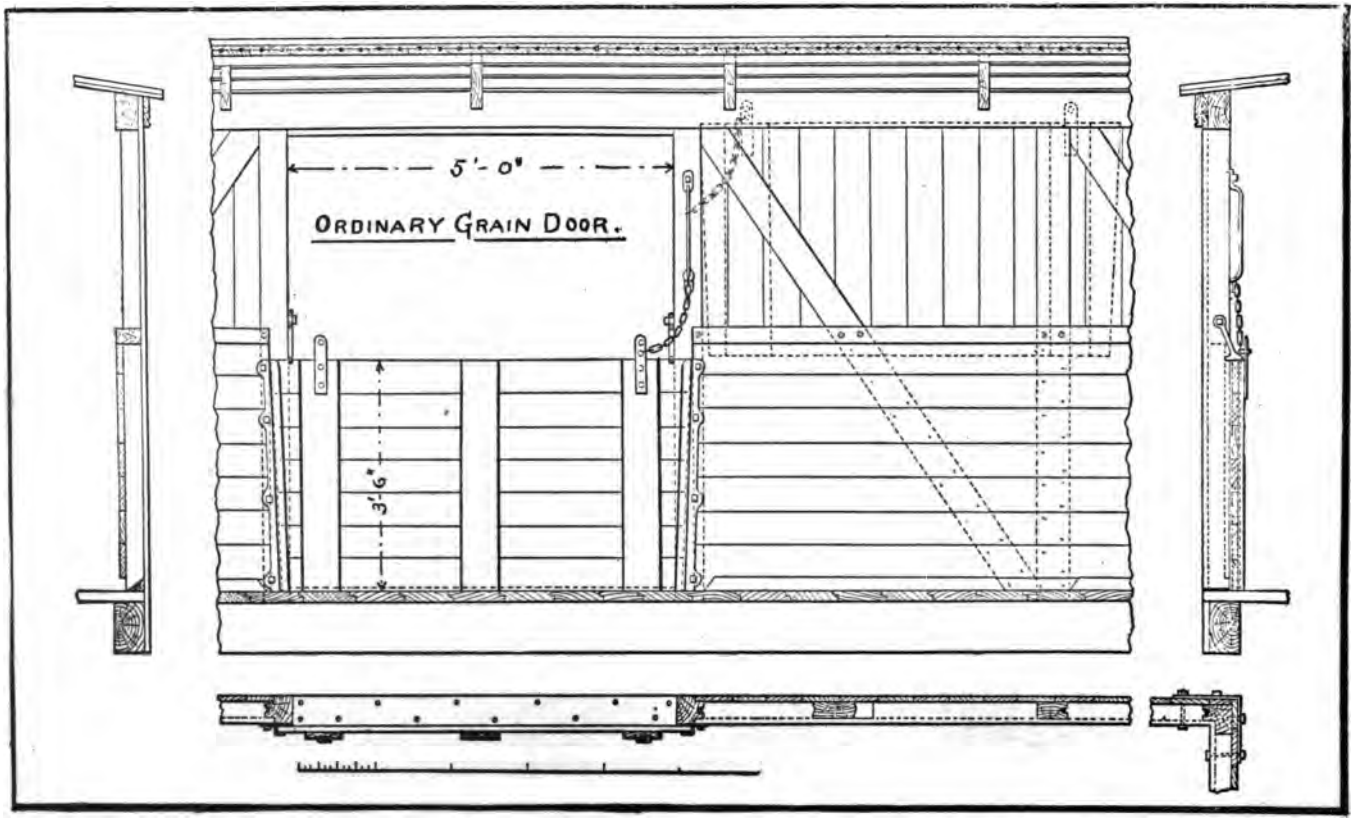
McGuire Star Grain Door.—All car manufacturers and railroad men are no doubt familiar with the principles of this

door. The illustrations show the door single, and with leaf both in position and stored under roof. The single door can be applied up to 3'–6" in height; if required higher than this the addition of a leaf or flap is necessary.

Chicago Rabbited Grain Door.—The principal difference between this door and the McGuire is that the door guides are arranged flush with the door post.

American Grain Door.—This door differs from both of the above in so far as the guides are hinged to the side plates and when the door is not in use are stored under roof with door.

NOTE.—It was impossible to obtain drawings showing the latest application of the Boss, or Williamson Grain Doors, and the bill of materials presented covers the application of these doors to the last cars requiring them that were built under the supervision of the writer.


5'-0"
ORDINARY GRAIN DOOR.
3'6"

ORDINARY GRAIN DOOR.

Complete Bill of all Materials Necessary to Apply the Ordinary Grain Door to Car.

(Door 3′ 6″ High, Door Opening 5′ 0″.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	Wt.
4	Lifts	Oak.	⅞″x5¾″x ′ ″	1″ x 6″ x 1′ 0″	2
6	Battens	Pine.	⅞ x5¾ x3 6	1 x 6 x 3 6	11
12	Sheathing	"	⅞ x5¼ x5 3	1 x 6 x 6 0	36
2	Rails, tongued	Oak.	⅞ x5¼ x5 3	1 x 6 x 6 0	6
2	" grooved	"	⅞ x5¼ x5 3	1 x 6 x 6 0	6
					61

CASTINGS.

Pcs.	Patterns.	Description.	Mat'l.	Wt.
4	.....	Door guides	Gray Iron	140
4	.....	" stops	" "	12
				152

FORGINGS AND BOLTS.

C. W.	W.W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			4	Hangers	1½″x ⅜″x0′ 9 ″	6
			2	Chain slide	½ x2 0	3
			4	Storage hooks	½ x0 6	1
		1	8	Hangers to door, C. B	½ x0 3½	2
			4	Chain slide to door post, lag	½ x0 4¼	1
			16	Door guides " " " "	½ x0 4¼	4
			4	" stops " " " "	½ x0 4¼	1
						18

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	Nails, battens to sheathing	6d clinch	1½
2 ft.	Chain, ¼″ short link		1½
8	U. S. Standard square nuts	For ½″ bolts.	1

ORDINARY GRAIN DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Am't.
14	feet.	Lumber, oak, rails, etc.....		
47	"	Pine, sheathing and battens.		
61	"			
47	"	Kiln drying.....		
152	lbs.	Castings, gray iron.....		
18	"	Wrought iron.....		
1½	"	Nails, clinch.....		
1½	"	Chain, ¼".....		
1	"	Square nuts.....		
		Labor:		
		Lumber yard.....		
		Mill.....		
		Blacksmith.....		
		Iron machine.....		
		Bolt room.....		
		Car builders.....		
		General labor.....		
		" expense.....		
		RECAPITULATION.		
		Materials.....		
		Labor.....		
		General expense.....		

VAN LEW'S FLEXIBLE GRAIN DOOR.

Complete Bill of all Materials Necessary to Apply the Van Lew Grain Door to Car.

(Two Side Doors, 5′ 0″ Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B.M.
2	(Extra) Carlines at door post.....	Oak	1⅞″x 3 ″x 8′ 5″	2″ x 3½″ x 8 ′9″	10′
22	Door slats.....	W.pine	1⅜ x 5 x 5 2½	1½ x 6 x 6 0	99
6	Furring on carline.	Oak	1 x 1½ x 4 4½	1¼ x 1⅝ x 4 6	5
2	" " "	"	1½ x 4 x 2 3	1⅝ x 4¼ x 2 6	3
2	" " "	"	1½ x 4 x 0 6	1⅝ x 4¼ x 1 0	1
					118
1	Center carline.....		1⅝ x 9 x 8 5	2 x 9½ x 8 9	14
	Credited—cannot be used with this door				104′

CASTINGS.

Pcs.	Pattern.	Description.	Mat'l	Wt.
2	.....	Curved guides, right.....	Gray Iron.....	13
2	.....	" " left.....	" "	13
4	.....	Straight "	" "	39
4	.....	" "	" "	39
2	.....	Lock bodies.....	" "	1½
2	.....	" hoods.....	" "	1
2	.....	Lifts.....	" "	3
				109½

FORGINGS AND BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			2	Face plates.....	1¾″ x ¼″ x 5′ 1¾″	15
			4	" "	1¾ x ¼ x 2 3¾	14
			2	" bottom edge.....	1 x ⅛ x 1 0	1
			2	" top "	1 half oval 5 1¾	9
			8	Pins with 10″ chain.....	½ x 0 4	2
			8	Staples to drive.....	¼ x 0 3½	1
			4	Lags for catch.....	⅜ x 0 3	1
						43

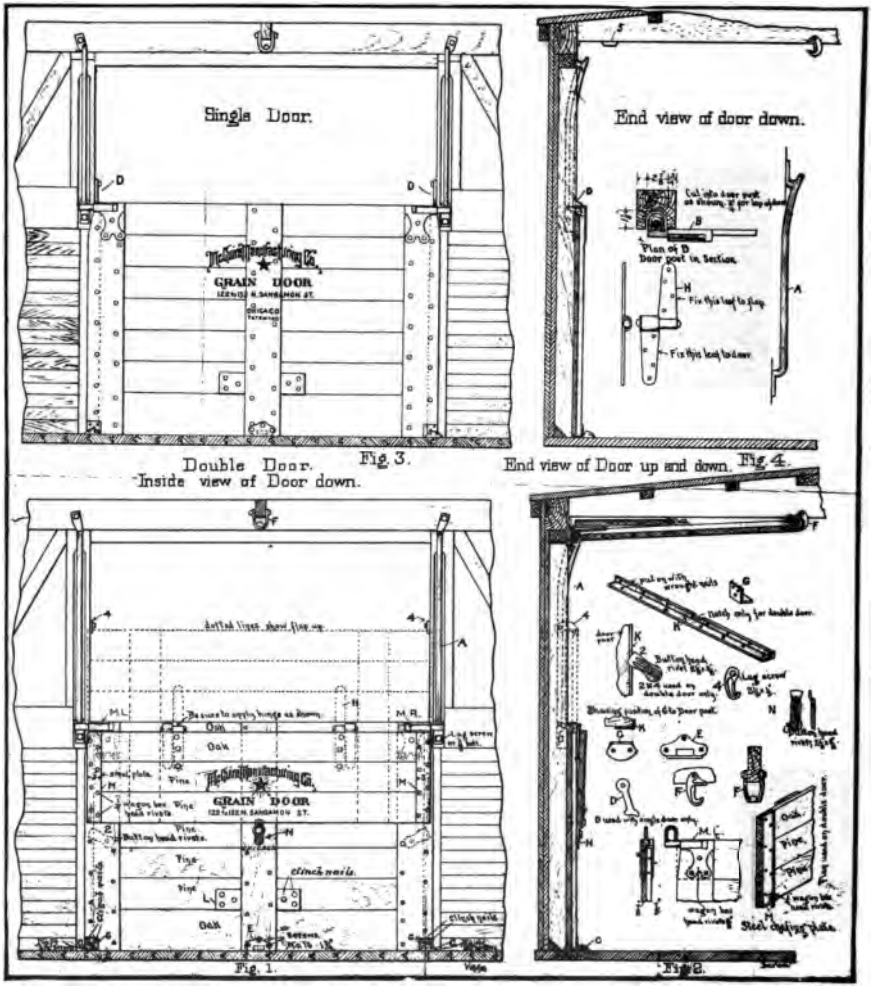
VAN LEW'S FLEXIBLE GRAIN DOOR. (Continued.)

MISCELLANEOUS MATERIAL.

Per Car.	Description.	Size.	Wt.
30 ft.	Coppered steel wire	No. 11, B.W.G.	
7 "	Bright twist chain	" 0.	
1 lb.	Nails, furring to carlines	8d Cut.	
	Flat Head Iron Wood Screws:		
32	Middle face plate	1¼" No. 14.	
32	Bottom " "	1¼ No 14.	
6	" " " (short)	1 No. 12.	
24	Half oval plates	1½ No. 12.	
10	Lifts	1¼ No. 14.	
80	Cast guides	1½ No. 16.	
184			
	Royalty per car. This patent is owned by the Van Lew Grain Door Co., of Aurora, Ill.		

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
99	Feet.	Lumber, clear, white pine			
19	"	" oak			
118	"				
99	Feet.	Kiln drying			
109½	Lbs.	Castings			
43	"	Wrought iron			
30	Feet.	Coppered steel wire			
7	"	Bright chain, No. 0			
1	Lb.	Nails			
184		F. H. I. wood screws			
		Royalty			
14	Feet.	Credit—Lumber, oak, center carline			
		Labor:			
		Lumber yard			
		Mill			
		Blacksmith			
		Iron machine			
		Bolt room			
		Car builders			
		General labor			
		" expense			
		RECAPITULATION.			
		Materials			
		Labor			
		General expense			


Single Door.
GRAIN DOOR
End view of door down.
Plan of D
Door post in Section.
Fix this leaf to stay.
Fix this leaf to door.
Double Door. Fig 3.
Inside view of Door down.
End view of Door up and down. Fig 4.
GRAIN DOOR
Oak
Pine
clinch nails
Fig. 1.
Fig 2.

McGUIRE GRAIN DOOR.

Complete Bill of all Materials Necessary to Apply the McGuire Grain Door to Car.

(Door. Without Leaf, 3′ 6″ High, Door Opening 5′ 0″.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Lifts	Oak.	$\frac{7}{8}$″ x 5$\frac{3}{4}$″ x	1″ x 6″x 1′ 0″	2′
6	Battens	Pine.	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 3′ 6″	$\frac{1}{2}$(1 x 6 x 7 0)	11
12	Sheathing	"	$\frac{7}{8}$ x 5$\frac{1}{4}$ x 5 3	1 x 6 x 6 0	36
2	Rails, grooved	Oak.	$\frac{7}{8}$ x 5$\frac{1}{4}$ x 5 3	1 x 6 x 6 0	6
2	" tongued	"	$\frac{7}{8}$ x 5$\frac{1}{4}$ x 5 3	1 x 6 x 6 0	6
					61′

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	1	4	Rods to plate	$\frac{5}{8}$″ x 6$\frac{1}{2}$″	2
			4	" " post, lags	$\frac{5}{8}$ x 0 5″	2
		1	2	Hook to carlines	$\frac{1}{2}$ x 4$\frac{3}{4}$	1
			4	Lock to post, lags	$\frac{1}{2}$ x 3$\frac{5}{8}$	1
						6

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	Grain door materials complete for two doors, without leaf, including: 4 rods, A; 4 arms, B; 4 stops, C; 4 hooks, D; 2 slots, E; 2 carline hooks, F; 4 bottom angles, G; 4 post angles, K; 4 locks, 2; all as furnished by the McGuire Manufacturing Company, Chicago, Ill.		
8	Wagon box rivets, arms to door	$\frac{3}{8}$″ x 2 ″	
4	" " " " " "	x 2$\frac{1}{4}$	
4	" " " lock " "	x 2$\frac{1}{8}$	
	Nails:		
	Batten to door	6d clinch.	1$\frac{1}{2}$
	Angles to door post	1$\frac{1}{4}$″No.9B.W	$\frac{3}{4}$
	Flat head iron wood screws:		2$\frac{1}{4}$
8	Stops to floor	2$\frac{1}{2}$″ No. 14	
6	Slot to door	1$\frac{3}{4}$ " 16	
14			
4	U. S. standard square nuts	For $\frac{5}{8}$″ bolt	1
2	" " " "	" $\frac{1}{2}$ "	
4	Wrought washers	" $\frac{5}{8}$ "	

M'GUIRE GRAIN DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
14	feet.	Lumber, oak		
47	"	Pine		
61	"			
47	"	Kiln drying		
6	lbs.	Wrought iron		
1	"	Nuts and washers		
16		Rivets		
16		F. H. I. wood screws		
2¼	"	Nails		
2	sets.	Grain door fixtures complete		
		Labor:		
		Lumber yard		
		Mill		
		Bolt room		
		Car builders		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		
		Add for leaf		

McGUIRE GRAIN DOOR—(Continued.)

Additional Materials Required for 12" Leaf.

LUMBER.

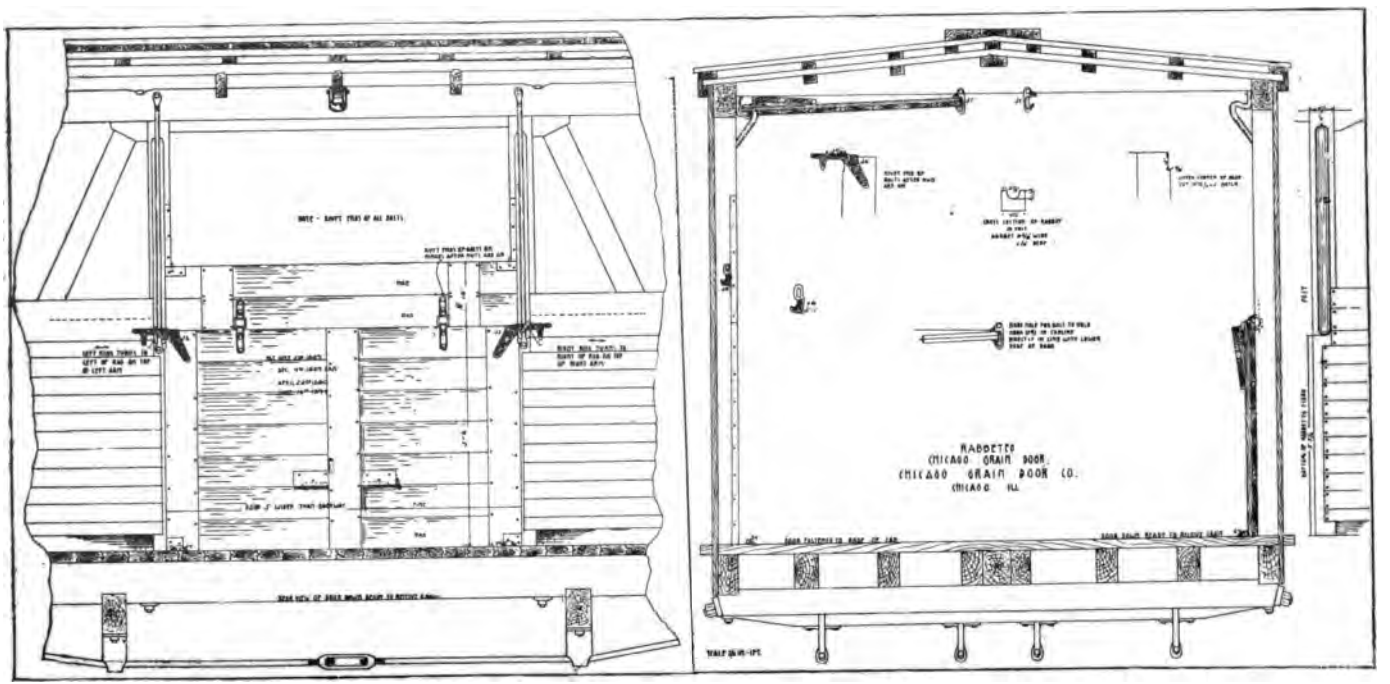
Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Leaf battens	Oak.	7/8"x5¾"x1' 0"	1"x6" x 1' 3"	3'
2	" pieces, tongued	"	7/8 x6 x5 9	1 x6¾ x 6 0	7
2	" " grooved	"	7/8 x6 x5 9	1 x6¼ x 6 0	6
					16'

MISCELLANEOUS MATERIALS.

Per Car.		Description.	Size.	Wt.
2	Sets.	Extra Door Materials for Leaf, including		
		4 hooks, No. 4		
		4 leaf bands		
		4 wrought hinges		
		2 buttons, No. 203		
32		Rivets for hinges	¼"x1⅛"	
32		" " angle irons	¼ x1⅛	
2		" " button to door	⅜ x2⅛	
2		Lags for leaf hook to post	½ x2½	
½		Nails	6d Clinch.	

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
16	Feet.	Lumber, oak		
1	lb.	Wrought iron		
66		Rivets		
½	lb.	Nails, 6d clinch		
2	Sets.	Extra door materials		
		Labor:		
		Lumber yard		
		Mill		
		Bolt room		
		Car builders		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		


RABBETT
CHICAGO GRAIN DOOR.
CHICAGO GRAIN DOOR CO.
CHICAGO ILL.

CHICAGO GRAIN DOOR.

Complete Bill of all Materials Necessary to Apply the Chicago Grain Door to Car.

(Door without leaf 3′ 6″ high, 5 ft. door opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M
4	Lifts	Oak.	$\frac{7}{8}$″ x 5$\frac{3}{4}$″ x ..	1″ x 6″ x 1′ 0″ ...	2
6	Battens	Pine.	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 3′ 6″ ..	1 x 6 x 3 6 ...	11
12	Sheathing	"	$\frac{7}{8}$ x 5$\frac{1}{4}$ x 5 3 ..	1 x 6 x 6 0 ...	36
2	Rails, tongued	Oak.	$\frac{7}{8}$ x 5$\frac{1}{4}$ x 5 3 ..	1 x 6 x 6 0 ...	6
2	" grooved	"	$\frac{7}{8}$ x 5$\frac{1}{4}$ x 5 3 ..	1 x 6 x 6 0 ...	6
					61

BOLTS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
1	1		12	Arms to door, counter sunk head	$\frac{3}{8}$″ x 3$\frac{1}{2}$″	1
	1		4	Rods to plate	$\frac{1}{2}$ x 6$\frac{1}{2}$	1
	1		2	Hook to carlines	$\frac{1}{2}$ x 4$\frac{3}{4}$	1
			4	Rod to post, lag	$\frac{1}{2}$ x 4$\frac{1}{2}$	1
			4	Lock " " "	$\frac{1}{2}$ x 3$\frac{1}{2}$	1
						5

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	The Chicago Grain Door Fixtures, complete, for two doors, 5′ opening, including:		
	4 rods, $\frac{7}{8}$″, wrought iron.		
	4 arms, $\frac{7}{8}$″, " "		
	4 rings, $1\frac{13}{32}$ " "		
	4 corner angles, on post, 3′ 6″ long, steel.		
	4 " " " doors, 1$\frac{1}{2}$x2$\frac{1}{2}$, steel.		
	4 hooks, malleable iron, J 8.		
	2 " " " J 9.		
	2 slots, " " J 3.		
	4 stops. J 4		
	All as furnished by the Chicago Grain Door Company, of Chicago, Ill.		
	Nails:		
	Angles to door post	4d Cut	1
	Batten to door sheathing	6d Clinch	1$\frac{1}{2}$
	Angles to door	1$\frac{3}{4}$″ No. 9, B. W.	$\frac{3}{4}$
			3$\frac{1}{4}$
	Flat Head Iron Wood Screws:		
8	Stops to floor	2″ No. 16	
6	Slots to door	1$\frac{1}{2}$ No. 14	
14			
12	U. S. standard square nuts	For $\frac{3}{8}$″ bolt	1
6	" " " "	" $\frac{1}{2}$ "	
12	Wrought Washers	" $\frac{5}{8}$ "	

CHICAGO GRAIN DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.	
14	feet.	Lumber, oak			
47	"	pine			
	"				
61	feet.				
47	feet.	Kiln Drying			
5	lbs.	Wrought iron			
1	"	Nuts and washers			
3¼	"	Nails			
14		F. H. Iron wood screws			
2	sets.	Door materials			
		Labor:			
		Lumber yard			
		Mill			
		Bolt room			
		Car builders			
		General labor			
		" expense			
		RECAPITULATION.			
		Materials			
		Labor			
		General expense			

CHICAGO GRAIN DOOR—(Continued.)

Additional Material Required for 12" Leaf.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Leaf battens	Oak.	7/8"x5 3/4"x1' 0"	1"x6" x1' 3"...	3'
2	" pieces, tongued...	"	7/8 x6 x5 3	1 x6 3/4 x6 0 ...	7
2	" " grooved...		7/8 x6 x5 3	1 x6 1/4 x6 0 ...	6
					16'

BOLTS.

C. W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
1	1	16	Hinges to Door	3/8"x0' 2 1/4".....	2

MISCELLANEOUS MATERIALS.

Per Car.		Description.	Size.	Wt.
2	Sets.	Extra Door Materials, including		
		4 angles on post		
		4 plates, J. 7		
		4 link hinges		
16		Flat head iron wood screws	1" No. 8	
1/2	lb.	Nails	6d Clinch	
1	"	Nuts and washers		

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
16	Feet.	Lumber, oak		
2	Lbs.	Wrought iron		
1	"	Nuts and washers		
16		F. H. I. wood screws		
1/2	Lb.	Nails, 6d clinch		
2	Sets.	(Extra) Door materials		
		Labor:		
		Lumber yard		
		Mill		
		Car builders		
		Bolt room		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

AMERICAN GRAIN DOOR.

Complete Bill of all Materials Necessary to Apply the American Grain Door to Car.

(Door Without Leaf 3′ 6″ High, Door Opening 5′ 0″.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Lifts	Oak.	$\frac{7}{8}$″ x 5$\frac{3}{4}$″	1″ x 6″ x 1′ 3″	3′
6	Battens	Pine.	$\frac{7}{8}$ x 5$\frac{3}{4}$ x 3′ 6	1 x 6 x 3 6	11
12	Sheathing	"	$\frac{7}{8}$ x 5$\frac{1}{4}$ x 5 11	1 x 6 x 6 0	36
2	Rails, grooved	Oak.	$\frac{7}{8}$ x 5$\frac{1}{4}$ x 5 11	1 x 6 x 6 0	6
2	" tongued	"	$\frac{7}{8}$ x 5$\frac{1}{4}$ x 5 11	1 x 6 x 6 0	6
					62′

BOLTS AND RODS.

C. W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
		8	Guides to plate, lags	$\frac{1}{2}$″ x 4$\frac{5}{8}$″	2
1	1	2	Hook bracket to carlines	$\frac{1}{2}$ x 4$\frac{5}{8}$	1
	1	16	Arms to door, C. B	$\frac{1}{2}$ x 3$\frac{5}{8}$	3
					6

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	American Grain Door Fixtures complete for two side doors, 5′ 0″ opening, including:		
	4 Rods		
	4 Arms		
	4 Plates at bottom		
	4 Stops on floor		
	2 Slots		
	4 Hooks at top		
	2 " " carlines		
	All as furnished by the American Grain Door Company, of Chattanooga, Tenn:		
2	Rivets, hook and bracket	$\frac{3}{8}$″ x 2$\frac{3}{4}$″	
8	" plates to door	$\frac{1}{4}$ x 2$\frac{1}{2}$	
20	Wood screws		
3$\frac{1}{2}$ lbs	Nails	6d clinch.	
1 "	Nuts and washers		

AMERICAN GRAIN DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
15	feet.	Lumber, oak.....		
47	"	Pine.....		
62	"			
47	"	Kiln drying.....		
10		Rivets.....		
20		Wood screws.....		
6	lbs.	Wrought iron.....		
3½	"	Nails.....		
1	"	Nuts and washers.....		
2	sets.	Door fixtures.....		
		Labor :		
		Lumber yard.....		
		Mill.....		
		Bolt room.....		
		Car builders.....		
		General labor.....		
		" expense.....		
		RECAPITULATION.		
		Materials.....		
		Labor.....		
		General expense.....		

AMERICAN GRAIN DOOR—(Continued.)

Additional Materials Required for 12″ Leaf.

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Leaf battens	Oak.	$\frac{7}{8}$″x 5$\frac{3}{4}$″x 1′ 0″	1″x 6 ″x 1′ 3″	3′
2	" pieces, grooved	"	$\frac{7}{8}$ x 6 x 5 11	1 x 6$\frac{1}{4}$ x 6 0	6
2	" " tongued	"	$\frac{7}{8}$ x 6 x 5 11	1 x 6$\frac{1}{4}$ x 6 0	7
					16′

BOLTS AND RODS.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			4	Leaf hook to post, lags	$\frac{1}{2}$″x 0′ 3$\frac{5}{8}$″	1

MISCELLANEOUS MATERIAL.

Per Car.		Description.	Size.	Wt.
2	sets	Extra door materials for leaf		
28		Rivets for angle to leaf	$\frac{1}{4}$″x 1$\frac{1}{4}$″	
2		" " buttons to door		
$\frac{1}{2}$	lbs.	Nails	6 d clinch	
8		Wood screws	1 ′ No. 14	
32		Rivets for hinges	$\frac{1}{4}$″x 1$\frac{1}{4}$″	

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
16	Feet.	Lumber, oak		
1	Lb.	Wrought iron		
2	Sets.	Extra door materials		
62		Rivets		
$\frac{1}{2}$	Lb.	Nails		
8		Wood screws		
		Labor:		
		Lumber yard		
		Mill		
		Bolt room		
		Car builders		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

THE BOSS GRAIN DOOR.

Complete Bill of all Materials Necessary to Apply the Boss Grain Door to Car.

(Two Doors, Without Leaf, 3′ 6″ High, 5 Foot Door Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Top and bottom rails	Oak	$\frac{7}{8}$″ x 5$\frac{1}{4}$″ x	1″ x 6″ x 6′ 0″	12′
12	Filling	Pine	$\frac{7}{8}$ x 5$\frac{1}{4}$ x	1 x 6 x 6 0	36
4	Battens	"	$\frac{7}{8}$ x 5$\frac{3}{4}$ x	1 x 6 x 3 6	7
4	Braces	"	$\frac{7}{8}$ x 5$\frac{3}{4}$ x	1 x 6 x 4 0	8
2	Lifts	Oak	$\frac{7}{8}$ x	1 x 6 x 1 0	1
					64′

BOLTS, RIVETS, ETC.

C. W.	W. W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
			24	Rivets, guides to post, B. H	$\frac{1}{2}$″ x 5$\frac{7}{8}$″	8
			12	" " " door, "	$\frac{3}{8}$ x 3$\frac{1}{2}$	1
		1	2	Hook to carlines	$\frac{1}{2}$ x 4$\frac{5}{8}$	1
						10

MISCELLANEOUS MATERIALS.

Per Car.		Description.	Size.	Wt.
		Grain door materials complete for two doors, including: 4 sliding guides on door post.. 4 fixed " " " ..... 8 guides on door post ..... 2 hooks to hold door up..... 4 guide catches on side plate.. All as furnished by the Boss Grain Door Co.	1″ x $\frac{1}{4}$″	
3	lbs	Nails	6 d clinch.	
8		Flat head iron wood screws, guide catch to plate	1$\frac{1}{2}$″ No. 16.	
10		Flat head iron wood screws, lift to door.....		
18				
2		Nuts, $\frac{1}{2}$″ square		

BOSS GRAIN DOOR—Continued.

SUMMARY.

Quantity.		Specifications.	Price	Amount.		
13	Feet.	Lumber, oak, rails, etc.				
51	"	" pine, filling and battens				
64	"					
51	"	Kiln drying				
10	lbs.	Wrought iron				
2	Sets.	Grain door fixtures complete				
3	lbs.	Nails, clinch				
18		F. H. iron wood screws				
2	Only.	Square nuts				
		Labor.				
		Lumber yard				
		Mill				
		Car builders				
		Bolt room				
		General labor				
		" expense				
		RECAPITULATION.				
		Materials				
		Labor				
		General expense				

WILLIAMSON GRAIN DOOR.

Complete Bill of all Materials Necessary to Apply the Williamson Grain Door to Car.

(Two Doors Without Leaf, 5′ 0″ Opening.)

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
4	Top and bottom rails ..	Oak.	$\frac{7}{8}$″ x $4\frac{3}{8}$″ x 5′ $1\frac{1}{4}$″	1 ″ x 6 ″ x 6′ 0″	12′
4	Lift cleats	"	$1\frac{3}{8}$ x $1\frac{1}{4}$ x 0 $6\frac{3}{4}$	$1\frac{3}{4}$ x 2 x 0 9	1
6	Sheathing	Pine.	$\frac{7}{8}$ x $3\frac{1}{4}$ x 5 $1\frac{1}{4}$	1 x 4 x 6 0	12
10	"	"	$\frac{7}{8}$ x $5\frac{1}{4}$ x 5 $1\frac{1}{4}$	$1\frac{1}{2}$ x 6 x 6 0	30
4	Battens	"	$\frac{7}{8}$ x $1\frac{3}{4}$ x 3 9	$\frac{1}{2}$(1x 4 x 4 0)	3
6	"	"	$\frac{7}{8}$ x 5 x 3 9	1 x 6 x 4 0	12
					70′

BOLTS.

C. W.	W.W.	Nuts.	Pcs.	Description.	Size of Blank.	Wt.
	1	2	2	Hang up hook to car.....	$\frac{1}{2}$″x 0′ $4\frac{5}{8}$″....	1
			4	Hold down hook, lags	$\frac{1}{2}$ x 0 $3\frac{5}{8}$	1
			4	Door guide rods	$\frac{1}{2}$ x 0 $4\frac{1}{8}$	1
	1	1	12	Axle castings to door, C. B..	$\frac{3}{8}$ x 0 3	1
						4

MISCELLANEOUS MATERIALS.

Per Car.	Description.	Size.	Wt.
	The Williamson Grain Door Fixtures complete for two doors, including—		
	4 grain door rods,	$\frac{7}{8}$″ x wrought..	....
	2 " " lifts,	Malleable iron.	....
	4 " " slide thimbles,	" "	....
	2 " " hang up hooks,	" "	....
	4 " " hold down hooks,	" "	....
	4 " " floor blocks,	" "	....
	4 " " thimble axles,	" "	....
	4 " " castings on door posts,	" "	....
	4 " " " " " plate,	" "	....
	4 steel angles on grain door carriers,	Steel.	....
	4 " " " " door post,	"	....
	All as supplied by the Williamson Grain Door Co.		
	Flat Head Iron Wood Screws:		
8	Floor blocks.....	$2\frac{1}{2}$″ No. 16.....	....
8	Lift cleats	2 " 16.....	....
8	Castings to post.....	$1\frac{1}{2}$ " 14.....	....
12	" " plate.....	$1\frac{1}{2}$ " 12.....	....
12	Corner irons	$1\frac{1}{2}$ " 8.....	....
8	" "	1 " 8.....	....
6	Iron lifts	1 " 16.....	....
62			
185	Nails, doors and battens	2 " No. 12, B.W.	$\frac{3}{4}$
48	" angles and door posts.....	$1\frac{1}{2}$ " 12, "	$\frac{1}{4}$
			1
12	U. S. Standard square nuts	For $\frac{3}{8}$″ bolt.....	$\frac{1}{2}$
4	" " " "	" $\frac{1}{4}$ "	$\frac{1}{4}$
			$\frac{3}{4}$
2	Wrought washers.....	For $\frac{1}{2}$″ bolt.....	$\frac{1}{8}$
12	" "	" $\frac{3}{8}$ "	$\frac{1}{4}$
			$\frac{3}{8}$

WILLIAMSON GRAIN DOOR—(Continued.)

SUMMARY.

Quantity.		Specifications.	Price.	Amount.
13	feet.	Lumber, oak, rails		
57	"	Pine, filling and battens		
70	"			
57	"	Kiln drying		
4	lbs.	Wrought iron		
1	"	Nails, B. W		
62		F. H. iron wood screws		
1⅛	"	Nuts and washers		
2	sets.	Grain door fixtures complete		
		Labor:		
		Lumber yard		
		Mill		
		Bolt room		
		Car builders		
		General labor		
		" expense		
		RECAPITULATION.		
		Materials		
		Labor		
		General expense		

CHAPTER X

WEIGHTS AND MEASURES

AND

GENERAL USEFUL INFORMATION FOR COMPILATION OF ESTIMATES.

BUSINESS LAWS IN DAILY USE.

The following compilation of business law contains the essence of a large amount of legal verbiage.

If a note is lost or stolen, it does not release the maker; he must pay it if the consideration for which it was given and the amount can be proven.

Notes bear interest only when so stated.

Principals are responsible for the acts of their agents.

Each individual in a partnership is responsible for the whole amount of the debts of the firm, except in cases of special partnership.

An agreement without consideration is void.

A note made on Sunday is void.

Contracts made on Sunday cannot be enforced.

A note by a minor is void.

A contract made with a minor is void.

A note obtained by fraud, or from a person in a state of intoxication, cannot be collected.

A receipt for money is not always conclusive.

The acts of one partner bind all the rest.

The maker of an "accommodation" bill or note (one for which he has received no consideration, having lent his name or credit for the accommodation of the holder) is not bound to the person accommodated, but is bound to all other parties precisely as if there was a good consideration.

Checks or drafts must be presented for payment without unreasonable delay.

If the drawee of a check or draft has changed his residence, the holder must use due or reasonable diligence to find him.

If one who holds a check, as payee or otherwise, transfers it to another, he has the right to insist that the check be presented that day, or, at farthest, on the day following.

A note indorsed in blank (the name of the indorser only written) is transferable by delivery of the same as if made payable to bearer.

If the time of payment of a note is not inserted, it is held payable on demand

An indorsee has a right of action against all whose names were on the bill when he received it.

If the letter containing a protest of non-payment be put into the postoffice, any miscarriage does not affect the party giving notice.

If two or more persons as partners are jointly liable on a note or bill, due notice to one of them is sufficient.

If a note or bill is transferred as security, or even as payment of a pre-existing debt, the debt revives if the bill or note be dishonored.

All claims which do not rest upon a seal or judgment must be sued within six years from the time when they arise.

Part payment of a debt which has passed the time of statutory limitation revives the whole debt, and the claim holds good for another period of six years from the date of such partial payment.

If when a debt is due the debtor is out of the State, the "six years" do not begin to run until he returns. If he afterwards leaves the State, the time forward counts the same as if he remained in the State.

An oral agreement must be proved by evidence, a written agreement proves itself. The law prefers written to oral evidence, because of its precision.

DOMESTIC POSTAGE.

First Class.—Letters and all written matter, whether sealed or unsealed, and all other matter sealed, nailed, sewed, tied, or fastened in any manner, so that it cannot be easily examined, two cents per ounce or fraction thereof. A "Special Delivery" ten cent stamp, when attached to a letter, in addition to the lawful postage, shall entitle the letter to immediate delivery at, or within one mile of, any post office. Postal cards, one cent each.

Second Class.—All regular newspapers, magazines, and other periodicals, issued at intervals not exceeding three months; the postage is one cent for each four ounces, payable by postage stamps.

Third Class.—Embraces printed books, pamphlets, circulars, engravings, lithographs, proof-sheets and manuscript accompanying the same, and all matter of the same general

character, and not having the character of personal correspondence. Circulars produced by hektograph or similar process, or by electric pen, are rated as third class. The limit of weight for mail matter of the third class is four pounds, except in the case of single books exceeding that weight. The rate of postage on mail matter of the third class is one cent for each two ounces or fraction thereof.

Fourth Class.—All mailable matter not included in the three preceding classes, which is so prepared for mailing as to be easily taken from the wrapper and examined. Rate, one cent per ounce or fraction thereof. Limit of weight, 4 lbs. Full prepayment compulsory. Liquids, and other like injurious matter, not admitted, except under conditions which may be learned at any post office.

Direct your mail matter to a post office, writing the name of the STATE plainly; and if to a city, add the street and number or post office box of the person addressed. Matter not addressed to a post office cannot be forwarded. Write or print your name and address, and the contents, if a package, upon the upper left hand corner of all mail matter. This will insure its immediate return to you for correction, if improperly addressed or insufficiently paid; and if it is not called for at destination it can be returned to you without going to the Dead Letter Office. If a letter, it will be returned free. Register all valuable letters and packages. REGISTRY Fee 8 cents, which, with the postage, must be fully prepaid. The name and address of sender must be given on the outside of the envelope or wrapper.

FEES CHARGED FOR MONEY ORDERS.

For orders for sums not exceeding	$ 2.50	.....	3 cents.
Over $ 2.50 and not exceeding	5.00	.....	5 cents.
Over 5.00 and not exceeding	10.00	.....	8 cents.
Over 10.00 and not exceeding	20.00	.....	10 cents.
Over 20.00 and not exceeding	30.00	.....	12 cents.
Over 30.00 and not exceeding	40.00	.....	15 cents.
Over 40.00 and not exceeding	50.00	.....	18 cents.
Over 50.00 and not exceeding	60.00	.....	20 cents.
Over 60.00 and not exceeding	75.00	.....	25 cents.
Over 75.00 and not exceeding	100.00	.....	30 cents.

FOREIGN POSTAGE.

The rates of postage to the countries of the Universal Postal Union (embracing nearly every civilized country) are as follows:

ON LETTERS, five cents for each half ounce or fraction thereof—prepayment optional. Double rates are collected on delivery of unpaid or short-paid letters.

ON NEWSPAPERS, books, pamphlets, photographs, sheet-music, maps, engravings, and similar printed matter, one cent for each two ounces or fraction thereof.

TO CANADA and Mexico, (including Nova Scotia, New Brunswick, Manitoba, and Prince Edward Island): LETTERS, two cents for each ounce or fraction thereof; books, circulars and similar printed matter, one cent for each two ounces or fraction thereof; SECOND CLASS MATTER, same as in the United States; SAMPLES OF MERCHANDISE (no dutiable article or articles of intrinsic value admitted), ten cents for each package, which must not exceed 8 ounces in weight—prepayment compulsory.

TO AUSTRALIA (except New South Wales, Queensland, and Victoria), via San Francisco: On Letters, five cents for each half ounce or fraction thereof; On Newspapers, two cents each—prepayment compulsory.

LIMITS OF SIZE AND WEIGHT.—Packages of samples of merchandise to the countries named above (except Great Britian, France, Belgium, and Switzerland) must not exceed 8¾ ounces in weight, nor measure more than 8 inches in length, 4 inches in breadth, and 2 inches in depth; and packages of printed matter must not exceed 4 pounds 6 ounces in weight. Packages of merchandise samples to Great Britain, France, Belgium and Switzerland, are limited to 12 ounces in weight, 12 inches in length, 8 inches in width, and 4 inches in depth. Packages of printed matter to Germany and Great Britain are limited to 2 feet in length and 1 foot in each other dimension.

INTERNATIONAL OR FOREIGN MONEY-ORDER FEES.

On Algeria, Belgium, British India, Cape Colony, Constantinople, Denmark, Dominion of Canada, Egypt, England,

France, German Empire, Hong Kong, Ireland, Italy, Jamaica, Japan, Newfoundland, New South Wales, New Zealand, Portugal, Sandwich Islands, Scotland, Shanghai, Sweden, Switzerland, Tasmania, Victoria.

For sums not exceeding $10 ..... 10 cents.
Over $10 and not exceeding $20 ..... 20 cents.
Over $20 and not exceeding $30 ..... 30 cents.
Over $30 and not exceeding $40 ..... 40 cents.
Over $40 and not exceeding $50 ..... 50 cents.

Orders can also be obtained on Austria and East Indies, by remittance through the Postal Department of Switzerland, subject to the rates of the Swiss Department to those countries. Also on Norway and the Netherlands, through the Postal Department of the German Empire, subject to the rates of the German Department to those countries.

Maximum amount to United Kingdom of Great Britain and Ireland, Cape Colony, Jamaica, British Guiana and Bermuda $50.00. To other British Provinces and all other countries in Postal Union, the limit is $100.00 on single order.

WEIGHTS AND MEASURES.

United States and British measures of length and weight, of the same denomination, may, for all ordinary purposes, be considered as equal, but the liquid and dry measures of the same denomination differ widely in the two countries. The standard measure of length of both countries is theoretically that of a pendulum vibrating seconds at the level of the sea, in the latitude of London, in a vacuum, with Fahrenheit's thermometer at 62 degrees. The length of such a pendulum is supposed to be divided into 39.1393 equal parts, called inches; and 36 of these inches were adopted as the standard yard of both countries. But the Parliamentary standard having been destroyed by fire in 1834, it was found to be impossible to restore it by measurement of a pendulum; and the present British standard yard is, in consequence, shorter than that of the United States by the latest comparison, about 1 part in 40,000, or .03 inch in 100 feet; or 1.584 inches in a mile. But at a temperature of 62.25 degrees Fah. for the British standard and 59.62 for the United States one, the two

are of the same length, and on this basis the United States government declares the measures of the two countries to be the same, as in our tables.

TROY WEIGHT—U. S. AND BRITISH.

Pounds.	Ounces.	Penny-weights.	Grains.
1.	12.	240.	5760.
.08333	1.	20.	480.
	.05	1.	24.
		.041667	1.

Troy weight is used for gold and silver.

A carat of the jewelers, for precious stones, is in the U. S. equal to 3.2 grs.; in London, 3.17 grs.; in Paris, 3.18 grs., divided into 4 jewelers' grs. In Troy, Apothecaries' and Avoirdupois, the grain is the same.

APOTHECARIES' WEIGHT—U. S. AND BRITISH.

Pounds.	Ounces.	Drams.	Scruples.	Grains.
1.	12.	96.	288.	5760.
.08333	1.	8.	24.	480.
	.16666	1.	3.	60.
		.33333	1.	20.
			.05	1.

In Troy and Apothecaries' weights, the grains, ounces and pounds are the same.

AVOIRDUPOIS OR ORDINARY COMMERCIAL WEIGHT—U. S. AND BRITISH.

Ton.	Cwts.	Pounds.	Ounces.
1.	20.	2240.	35840.
0.050	1.	112.	1792.
	0.0089	1.	16.
		0.0625	1.

A stone = 14 pounds. A quintal = 100 pounds avoir.

The standard of the avoir. pound, which is the one in common commercial use, is the weight of 27.7015 cu. ins. of pure distilled water, at its maximum density at about 39.2 degrees Fahr. in latitude of London, at the level of the sea; barom. at 30 ins. But this involves an error of about 1 part in 1362, for the 1 lb. of water 27.68122 cu. ins.

A Troy lb. = .82286 avoir. lbs. An avoir. lb. = 1.21528 troy or apoth.

A Troy oz. = 1.09714 avoir. oz. An avoir. oz. = .911458 troy or apoth.

LONG MEASURE—U. S. AND BRITISH.

Miles.	Rods.	Yards.	Feet.	Inches.
1.	320.	1760.	5280.	63360.
.003125	1.	5.5	16.5	198.
.000568	.1818	1.	3.	36.
.0001894	.0606	.3333	1.	12.
.0000158	.005051	.02778	.08333	1.

A point = 1/72 inch. A line = 6 points = 1/12 inch. A palm = 3 inches.

A hand = 4 inches. A span = 9 inches. A fathom = 6 feet. A cable's length = 120 fathoms = 720 feet. A Gunter's surveying chain is 66 feet, or 4 rods long; it is divided into 100 links of 7.92 inches long. Eighty Gunter's chains = 1 mile.

SQUARE OR LAND MEASURE.—U. S. AND BRITISH.

Sq. M.	Acres	Sq. Rods.	Sq. Yards.	Sq. Feet.	Sq. Ins.
1.	640.	102400.	3097600.	27878400.	
	1.	160.	4840.	43560.	6272640
		1.	30.25	272.25	39204
		.0331	1.	9.0	1296
			.111	1.	144
				.00694	1

A section of land is 1 mile square, or 27878400 square feet; or 3097600 square yards; or 640 acres. An acre contains 10 square Gunter's chains. A square acre is 208.710 feet; a

square half acre, 147.581 feet; and a square quarter acre 104.355 feet on each side. A circular acre is 235.504 feet; a circular half acre, = 166.527 feet; and a circular quarter acre = 117.752 feet diameter. A circular inch is a circle of 1 inch diameter; and a square foot, = 183.346 cir. inches. Also 1 square inch, = 1.27324 cir. inches; and 1 cir. inch, = .7854 of a square inch.

CUBIC OR SOLID MEASURE.—U. S. AND BRITISH.

1728 cubic inches.....1 cubic, or solid foot.
27 cubic feet.....1 cubic, or solid yard.

A cord of wood, = 128 cubic feet; being 4 feet x 4 feet x 8 feet. A perch of masonry actually contains 24¾ cubic feet; being 16½ feet x 1½ feet x 1 foot. It is generally taken at 25 cubic feet; but by some at 22, etc.; and there is every probability that a payer will be cheated unless the number of cubic feet be distinctly agreed upon in his contract. It is gradually falling into disuse among engineers; and the cu. yard is very properly taking its place. To reduce cubic yards to perches of 25 cubic feet, multiply by 1.080; and to reduce perches to cubic yards, multiply by .926. The British rod of brick work, for house builders, is 16½ feet square, by 14 inches (1½ English bricks) thick, = 272¼ square feet of 14 inch wall. It is conventionally taken at 272 square feet; which gives 317⅓ cubic feet. In British engineering works the rod is 306 cubic feet, or 11⅓ cu. yds. The Montreal (Canada) toise = 261½ cu. ft., or 9.6852 cu. yds.; or 10.46 perches of 25 cu. ft. The Canadian chaldron = 58.64 cubic feet. A ton (2240 pounds) of Pennsylvania anthracite, when broken for domestic use, occupies from 41 to 43 cubic feet of space; the mean of which is equal to 1.556 cubic yards, or a cube of 3.476 feet on each edge. Bituminous coal 44 to 48 cubic feet; mean equal to 1.704 cubic yards, or a cube of 3.583 feet on each edge. Coke 80 cubic feet.

A cubic foot is equal to

.803564 U. S. struck bushels of 2150.42 cubic inches, or 1.24445 cubic feet.
.779013 British bushel of 2218.191 cubic inches, or 1.28368 cubic feet.
3.21426 U. S. pecks.
3.11605 British pecks.

7.48052 U. S. liquid gallons of 231 cubic inches.
6.42851 U. S. dry gallons.
6.23210 British gallons of 277.274 cubic inches.
29.92208 U. S. liquid quarts.
25.71405 U. S. dry quarts.
24.92842 British quarts.
59.84416 U. S. liquid pints.
51.42809 U. S. dry pints.
49.85684 British pints.
239.37662 U. S. gills.
199.42737 British gills.
.26667 flour barrels of 3 struck bushels.
.23748 U. S. liquid barrel of 31½ gallons.

A cubic inch is equal to

.0005787 cubic feet; or to .138528 U. S. gill; or 1.90985 spherical inches.

A cubic yard is equal to

27 cubic feet or to 201.974 U. S. gallons; 46656 cubic inches; 7.2 flour barrels of 3 struck bushels; 21.69623 U. S. struck bushels; 21.03336 British bushels.

A sphere 1 foot in diameter contains

.01939 cubic yards.
.5236 cubic feet.
904.781 cubic inches.
.42075 U. S. bushel.
1.6830 U. S. pecks.
13.4639 U. S. dry quarts.
26.9278 U. S. dry pints.
3.9168 U. S. liquid gallons.
15.6672 U. S. liquid quarts.
31.3344 U. S. liquid pints.
125.3376 U. S. liquid gills.
3.2631 British imp. galls.
13.6525 British imp. quarts.
26.1050 British imp. pints.
104.4201 British imp. gills.

LIQUID MEASURE—U. S. ONLY.

The basis of this measure in the U. S. is the old British wine gallon of 231 cub. ins.; or 8.33888 lbs. avoir. of pure water, at its max. density of about 39.2° Fahr.: the barom. at 30 ins. A cylinder 7 ins. diam. and 6 ins. high contains 230.904 cub. ins. or almost precisely a gallon; as does also a cube of 6.1358 ins. on an edge. Also a gallon = .13368 of a cub. ft.; and a cubic foot contains 7.48052 galls; nearly 7½

galls. This basis however involves an error of about 1 part in 1362, for the water actually weighs 8.345008 lbs.

Gal.	Qt.	Pt.	Gills.
1	4	8	32
.25	1	2	8
	.5	1	4
		.25	1

In the U. S. and Great Brit. 1 barrel of wine or brandy = 31½ galls; in Pennsylvania, a half barrel, 16 galls; a double barrel, 64 galls; a puncheon, 84 galls; a tierce, 42 galls. A liquid measure barrel of 31½ galls contains 4.211 cub. ft. = a cube of 1.615 ft. on an edge; or 3.384 U. S. struck bushels. A gill = 7.21875 cub. ins.

To reduce U. S. liquid measure to Brit. ones of the same denomination, divide by 1.20032; or near enough for common use, by 1.2; or to reduce Brit. to U. S. multiply by 1.2.

DRY MEASURE—UNITED STATES ONLY.

Struck Bush.	Pecks.	Gallons.	Quarts.	Pints.	Cubic Inch
1	4	8	32.	64	2150.
	1	2	8.	16	537.6
		1.	4.	8	268.8
		0.25	1.	2	67.2
		0.125	0.5	1	33.6

A gallon of liquid measure = 231 cubic inches.

A heaped bushel = 1¼ struck bushels. The cone in a heaped bushel must not be less than 6 inches high.

A barrel of U. S. hydraulic cement = 300 to 310 lbs., usually, and of genuine Portland cement = 425 lbs.

To reduce U. S. dry measures to British imperial of the same name, divide by 1.032.

MENSURATION.

Area of a triangle = base × ½ altitude.
Area of a parallelogram = base × altitude.
Area of a trapezoid = altitude × ½ the sum of parallel sides.

Area of a trapezium—divide into two triangles and find area of the triangles.

Circumference of circle = diameter × 3.1416.

Diameter of circle = circumference × .3183.

Area of circle = diameter of 2 × .7854.

Area of sector of circle = length of arc × ½ the radius.

Area of segment of circle = area of sector of equal radius—area of triangle, when the segment is less, and + area of triangle when the segment is greater than the semi-circle.

Area of circular ring=diameters of the two circles × difference of diameter and that product by .7854.

Side of square that shall equal area of circle=diameter × .8862, or circumference × .2821.

Diam. of circle that shall contain area of a given square = side of square × 1.1284.

Area of an ellipse = product of the two diameters × .7854.

Area of parabolia = base × ⅔ altitude.

Area of regular polygon = sum of its sides × perpendicular from its centre to one of its sides ÷ 2.

Surface of cylinder or prism = area of both ends + length × circumference.

Contents of cylinder or prism = area of end × length.

Surface of sphere = diameter × circumference.

Contents of sphere = diameter 3 × .5236.

Convex surface of segment of sphere = height of segment × circumference of the sphere of which it is part.

Contents of segment of sphere = (height 2 + three times the square of radius of base) × (height × .5236).

Surface of pyramid or cone = circumference of base × ½ of the slant height + area of the base.

Centents of pyramid or cone = area of base × ⅓ altitude.

Surface of frustum of cone or pyramid = sum of circumference at both ends × ½ slant height + area of both ends.

Contents of frustum of cone or pyramid = multiply areas of two ends together and extract square root. Add to this root the two areas and × ⅓ altitude.

Contents of a wedge = area of base × ½ altitude.

RULE

FOR FINDING THE WEIGHT OF CASTINGS OR FORGING BY THE WEIGHT OF THEIR PATTERNS.

Multiply the weight of the white pine pattern by

16 for cast iron,
17.1 " wrought iron,
17.3 " steel,
18 " copper,
25 " lead,
12.2 " tin,
13 " brass,
11.4 " zinc,

and the product is the weight of the casting.

WEIGHT OF VARIOUS SUBSTANCES.

Per Cubic Foot

NAME OF SUBSTANCES	Average Weight Pounds.
Aluminum	162
Anthracite, solid, of Pennsylvania	93
" broken, loose	54
" " moderately shaken	58
" heaped bushel, loose	(80)
Ash, American white, dry	38
Asphaltum	87
Brass (copper and zinc), cast	504
" rolled	524
Brick, best pressed	150
" common hard	125
" soft, inferior	100
Brickwork, pressed brick	140
" ordinary	112
Cement, hydraulic, ground, loose, Amer., Rosendale	56
" " " " " Louisville	50
" " " " English, Portland	90
Cherry, dry	42

Chestnut, dry	41
Clay, potters', dry	119
" in lump, loose	63
Coal, bituminous, solid	84
" " broken, loose	49
" " heaped bushel, loose	(74)
Coke, loose, of good coal	62
" " heaped bushel	(40)
Copper, cast	542
" rolled	548
Earth, common loam, dry, loose	76
" " " " moderately rammed	95
" as a soft flowing mud	108
Ebony, dry	76
Elm, dry	35
Flint	162
Glass, common window	157
Gneiss, common	168
Gold, cast, pure, or 24 carat	1204
" pure, hammered	1217
Granite	170
Gravel, about the same as sand, which see	
Gypsum (plaster of paris)	142
Hemlock, dry	25
Hickory, dry	53
Hornblende, black	203
Ice	58.7
Iron, cast	450
" wrought, purest	485
" " average	480
Ivory	114
Lead	711
Lignum Vitae, dry	83
Lime, quick, ground, loose, or in small lumps	53
" " " " thoroughly shaken	75
" " " " per struck bushel	(66)
Limestone and Marbles	168
" " " loose, in irregular fragments	96

Magnesium	109
Mahogany, Spanish, dry	53
" Honduras, dry	35
Maple, dry	49
Marbles. See limestones.	
Masonry, of granite or limestone, well dressed	165
" " mortar rubble	154
" " dry rubble (well scabbled)	138
" " sandstone, well dressed	144
Mercury, at 32 degrees Fahrenheit	849
Mica	183
Mortar, hardened	103
Mud, dry, close	80 to 110
" wet, fluid, maximum	120
Oak, live, dry	59
" white, dry	50
" other kinds	32 to 45
Petroleum	55
Pine, white, dry	25
" yellow, Northern	34
" " Southern	45
Platinum	1342
Quartz, common, pure	165
Rosin	69
Salt, coarse, Syracuse, N. Y	45
" Liverpool, fine, for table use	49
Sand, of pure quartz, dry, loose	90 to 106
" well shaken	99 to 117
" perfectly wet	120 to 140
Sandstones, fit for buildings	151
Shales, red or black	162
Silver	655
Slate	175
Snow, freshly fallen	5 to 12
" moistened and compacted by rain	15 to 50
Spruce, dry	25
Steel	490
Sulphur	125

Sycamore, dry	37
Tar	62
Tin, cast	459
Turf or Peat, dry, unpressed	20 to 30
Walnut, Black, dry	38
Water, pure rain or distilled, at 60° Fahrenheit	62⅓
" sea	64
Wax, bees	60.5
Zinc or Spelter	437.5

Green timbers usually weigh from one-fifth to one-half more than dry.

STRENGTH OF MATERIALS.

Ultimate Tensile Strength in lbs. per Square Inch.

METALS.	AVERAGE.
Brass, cast	18,000
Brass, wire	49,000
Bronze or Gun metal	36,000
Copper, cast	19,000
" sheet	30,000
" wire	60,000
Iron, cast, 13,400 to 29,000	16,500
" wrought, ordinary bar	45,000
" " bar, double refined	50,000 to 54,000
" " boiler plates	48,000 to 56,000
" wire	70,000 to 100,000
" " ropes	90,000
Lead, cast	2,000
Lead, pipe	1,650
Steel	65,000 to 120,000
Tin	4,600
Zinc	3,500

A bar of wrought iron will expand or contract 151200th of its length for each degree of heat: and assuming that the extreme range of temperature in this country is 140°. it will expand or contract with this change the 1080th of its length, which is equivalent to a force of 20,740 lbs., or 9¼ tons per square inch of section. The tensile strength is increased, in from 1 to 6 reheatings and rollings, from 43,904 to 61,824 lbs. and decreased again to 43,904 lbs. in from 6 to 12.

The tensile strength at different temperatures is as follows: 60°, 1; 114°, 1.14; 212°, 1.2; 250°, 1.32; 270°, 1.35; 325°, 1.41; 435°, 1.4.

WEIGHTS OF FLAT ROLLED IRON PER LINEAL FOOT.

For Thicknesses from 1/16 in. to 2 in. and Widths from 1 in. to 12¾ ins., Based on Iron Weighing 480 lbs. per cu. ft.

Thickness in Inches.	1″	1¼″	1½″	1¾″	2″	2¼″	2½″	2¾″	12″
1/16	.208	.260	.313	.365	.417	.469	.521	.573	2.50
1/8	.417	.521	.625	.729	.833	.938	1.04	1.15	5.00
3/16	.625	.781	.938	1.09	1.25	1.41	1.56	1.72	7.50
1/4	.833	1.04	1.25	1.46	1.67	1.88	2.08	2.29	10.00
5/16	1.04	1.30	1.56	1.82	2.08	2.34	2.60	2.86	12.50
3/8	1.25	1.56	1.88	2.19	2.50	2.81	3.13	3.44	15.00
7/16	1.46	1.82	2.19	2.55	2.92	3.28	3.65	4.01	17.50
1/2	1.67	2.08	2.50	2.92	3.33	3.75	4.17	4.58	20.00
9/16	1.88	2.34	2.81	3.28	3.75	4.22	4.69	5.16	22.50
5/8	2.08	2.60	3.13	3.65	4.17	4.69	5.21	5.73	25.00
11/16	2.29	2.86	3.44	4.01	4.58	5.16	5.73	6.30	27.50
3/4	2.50	3.13	3.75	4.38	5.00	5.63	6.25	6.88	30.00
13/16	2.71	3.39	4.06	4.74	5.42	6.09	6.77	7.45	32.50
7/8	2.92	3.65	4.38	5.10	5.83	6.56	7.29	8.02	35.00
15/16	3.13	3.91	4.69	5.47	6.25	7.03	7.81	8.59	37.50
1	3.33	4.17	5.00	5.83	6.67	7.50	8.33	9.17	40.00
1 1/16	3.54	4.43	5.31	6.20	7.08	7.97	8.85	9.74	42.50
1 1/8	3.75	4.69	5.63	6.56	7.50	8.44	9.38	10.31	45.00
1 3/16	3.96	4.95	5.94	6.93	7.92	8.91	9.90	10.89	47.50
1 1/4	4.17	5.21	6.25	7.29	8.33	9.38	10.42	11.46	50.00
1 5/16	4.37	5.47	6.56	7.66	8.75	9.84	10.94	12.03	52.50
1 3/8	4.58	5.73	6.88	8.02	9.17	10.31	11.46	12.60	55.00
1 7/16	4.79	5.99	7.19	8.39	9.58	10.78	11.98	13.18	57.50
1 1/2	5.00	6.25	7.50	8.75	10.00	11.25	12.50	13.75	60.00
1 9/16	5.21	6.51	7.81	9.11	10.42	11.72	13.02	14.32	62.50
1 5/8	5.42	6.77	8.13	9.48	10.83	12.19	13.54	14.90	65.00
1 11/16	5.63	7.03	8.44	9.84	11.25	12.66	14.06	15.47	67.50
1 3/4	5.83	7.29	8.75	10.21	11.67	13.13	14.58	16.04	70.00
1 13/16	6.04	7.55	9.06	10.57	12.08	13.59	15.10	16.61	72.50
1 7/8	6.25	7.81	9.38	10.94	12.50	14.06	15.63	17.19	75.00
1 15/16	6.46	8.07	9.69	11.30	12.92	14.53	16.15	17.76	77.50
2	6.67	8.33	10.00	11.67	13.33	15.00	16.67	18.33	80.00

WEIGHTS OF FLAT ROLLED IRON PER LINEAL FOOT. (Continued).

Thickness in Inches.	3″	3¼″	3½″	3¾″	4″	4¼″	4½″	4¾″	12″
1/16	.625	.677	.729	.781	.833	.885	.938	.990	2.50
1/8	1.25	1.35	1.46	1.56	1.67	1.77	1.88	1.98	5.00
3/16	1.88	2.03	2.19	2.34	2.50	2.66	2.81	2.97	7.50
1/4	2.50	2.71	2.92	3.13	3.33	3.54	3.75	3.96	10.00
5/16	3.13	3.39	3.65	3.91	4.17	4.43	4.69	4.95	12.50
3/8	3.75	4.06	4.38	4.69	5.00	5.31	5.63	5.94	15.00
7/16	4.38	4.74	5.10	5.47	5.83	6.20	6.56	6.93	17.50
1/2	5.00	5.42	5.83	6.25	6.67	7.08	7.50	7.92	20.00
9/16	5.63	6.09	6.56	7.03	7.50	7.97	8.44	8.91	22.50
5/8	6.25	6.77	7.29	7.81	8.33	8.85	9.38	9.90	25.00
11/16	6.88	7.45	8.02	8.59	9.17	9.74	10.31	10.89	27.50
3/4	7.50	8.13	8.75	9.38	10.00	10.63	11.25	11.88	30.00
13/16	8.13	8.80	9.48	10.16	10.83	11.51	12.19	12.86	32.50
7/8	8.75	9.48	10.21	10.94	11.67	12.40	13.13	13.85	35.00
15/16	9.38	10.16	10.94	11.72	12.50	13.28	14.06	14.84	37.50
1	10.00	10.83	11.67	12.50	13.33	14.17	15.00	15.83	40.00
1 1/16	10.63	11.51	12.40	13.28	14.17	15.05	15.94	16.82	42.50
1 1/8	11.25	12.19	13.13	14.06	15.00	15.94	16.88	17.81	45.00
1 3/16	11.88	12.86	13.85	14.84	15.83	16.82	17.81	18.80	47.50
1 1/4	12.50	13.54	14.58	15.63	16.67	17.71	18.75	19.79	50.00
1 5/16	13.13	14.22	15.31	16.41	17.50	18.59	19.69	20.78	52.50
1 3/8	13.75	14.90	16.04	17.19	18.33	19.48	20.63	21.77	55.00
1 7/16	14.38	15.57	16.77	17.97	19.17	20.36	21.56	22.76	57.50
1 1/2	15.00	16.25	17.50	18.75	20.00	21.25	22.50	23.75	60.00
1 9/16	15.63	16.93	18.23	19.53	20.83	22.14	23.44	24.74	62.50
1 5/8	16.25	17.60	18.96	20.31	21.67	23.02	24.38	25.73	65.00
1 11/16	16.88	18.28	19.69	21.09	22.50	23.91	25.31	26.72	67.50
1 3/4	17.50	18.96	20.42	21.88	23.33	24.79	26.25	27.71	70.00
1 13/16	18.13	19.64	21.15	22.66	24.17	25.68	27.19	28.70	72.50
1 7/8	18.75	20.31	21.88	23.44	25.00	26.56	28.13	29.69	75.00
1 15/16	19.38	20.99	22.60	24.22	25.83	27.45	29.06	30.68	77.50
2	20.00	21.67	23.33	25.00	26.67	28.33	30.00	31.67	80.00

WEIGHTS OF FLAT ROLLED IRON PER LINEAL FOOT.
(Continued.)

Thickness in Inches.	5″	5¼″	5½″	5¾″	6″	6¼″	6½″	6¾″	12″
1/16	1.04	1.09	1.15	1.20	1.25	1.30	1.35	1.41	2.50
1/8	2.08	2.19	2.29	2.40	2.50	2.60	2.71	2.81	5.00
3/16	3.13	3.28	3.44	3.59	3.75	3.91	4.06	4.22	7 50
1/4	4.17	4.38	4.58	4.79	5.00	5.21	5.42	5.63	10.00
5/16	5.21	5.47	5.73	5.99	6.25	6.51	6.77	7.03	12.50
3/8	6.25	6.56	6.88	7.19	7.50	7.81	8.13	8.44	15.00
7/16	7.29	7.66	8.02	8.39	8.75	9.11	9.48	9.84	17.50
1/2	8.33	8.75	9.17	9.58	10.00	10.42	10.83	11.25	20.00
9/16	9.38	9.84	10.31	10.78	11.25	11.72	12.19	12.66	22.50
5/8	10.42	10.94	11.46	11.98	12.50	13.02	13.54	14.06	25.00
11/16	11.46	12.03	12.60	13.18	13.75	14.32	14.90	15.47	27.50
3/4	12.50	13.13	13.75	14.38	15.00	15.63	16.25	16.88	30.00
13/16	13.54	14.22	14.90	15.57	16.25	16.93	17.60	18.28	32.50
7/8	14.58	15.31	16.04	16.77	17.50	18.23	18.96	19.69	35.00
15/16	15.63	16.41	17.19	17.97	18.75	19.53	20.31	21.09	37.50
1	16.67	17.50	18.33	19.17	20.00	20.83	21.67	22.50	40.00
1 1/16	17.71	18.59	19.48	20.36	21.25	22.14	23.02	23.91	42.50
1 1/8	18.75	19.69	20.63	21.56	22.50	23.44	24.38	25.31	45.00
1 3/16	19.79	20.78	21.77	22.76	23.75	24.74	25.73	26.72	47.50
1 1/4	20.83	21.88	22.92	23.96	25.00	26.04	27.08	28.13	50.00
1 5/16	21.88	22.97	24.06	25.16	26.25	27.34	28.44	29.53	52.50
1 3/8	22.92	24.06	25.21	26.35	27.50	28.65	29.79	30.94	55.00
1 7/16	23.96	25.16	26.35	27.55	28.75	29.95	31.15	32.34	57.50
1 1/2	25.00	26.25	27.50	28.75	30.00	31.25	32.50	33.75	60.00
1 9/16	26.04	27.34	28.65	29.95	31.25	32.55	33.85	35.16	62.50
1 5/8	27.08	28.44	29.79	31.15	32.50	33.85	35.21	36.56	65.00
1 11/16	28.13	29.53	30.94	32.34	33.75	35.16	36.56	37.97	67.50
1 3/4	29.17	30.63	32.08	33.54	35.00	36.46	37.92	39.38	70.00
1 13/16	30.21	31.72	33.23	34.74	36.25	37.76	39.27	40.78	72.50
1 7/8	31.25	32.81	34.38	35.94	37.50	39.06	40.63	42.19	75.00
1 15/16	32.29	33.91	35.52	37.14	38.75	40.36	41.98	43.59	77.50
2	33.33	35.00	36.67	38.33	40.00	41.67	43.33	45.00	80.00

WEIGHTS OF FLAT ROLLED IRON PER LINEAL FOOT.
(Continued.)

Thickness in Inches.	7″	7¼″	7½″	7¾″	8″	8¼″	8½″	8¾″	12″
1/16	1.46	1.51	1.56	1.61	1.67	1.72	1.77	1.82	2.50
1/8	2.92	3.02	3.13	3.23	3.33	3.44	3.54	3.65	5.00
3/16	4.38	4.53	4.69	4.84	5.00	5.16	5.31	5.47	7.50
1/4	5.83	6.04	6.25	6.46	6.67	6.88	7.08	7.29	10.00
5/16	7.29	7.55	7.81	8.07	8.33	8.59	8.85	9.11	12.50
3/8	8.75	9.06	9.38	9.69	10.00	10.31	10.63	10.94	15 00
7/16	10.21	10.57	10.94	11.30	11.67	12.03	12.40	12.76	17.50
1/2	11.67	12.08	12.50	12.92	13.33	13.75	14.17	14.58	20.00
9/16	13.13	13.59	14.06	14.53	15.00	15.47	15.94	16.41	22.50
5/8	14.58	15.10	15.63	16.15	16.67	17.19	17.71	18.23	25.00
11/16	16.04	16.61	17.19	17.76	18.33	18.91	19.48	20.05	27.50
3/4	17.50	18.13	18.75	19.38	20.00	20.63	21.25	21.88	30.00
13/16	18.96	19.64	20.31	20.99	21.67	22.34	23.02	23.70	32.50
7/8	20.42	21.15	21.88	22.60	23.33	24.06	24.79	25.52	35.00
15/16	21.88	22.66	23.44	24.22	25.00	25.78	26.56	27.34	37.50
1	23.33	24.17	25.00	25.83	26.67	27.50	28.33	29.17	40.00
1 1/16	24.79	25.68	26.56	27.45	28.33	29.22	30.10	30.99	42.50
1 1/8	26.25	27.19	28.13	29.06	30.00	30.94	31.88	32.81	45.00
1 3/16	27.71	28.70	29.69	30.68	31.67	32.66	33.65	34.64	47.50
1 1/4	29.17	30.21	31.25	32.29	33.33	34.38	35.42	36.46	50.00
1 5/16	30.62	31.72	32.81	33.91	35.00	36.09	37.19	38.28	52.50
1 3/8	32.08	33.23	34.38	35.52	36.67	37.81	38.96	40.10	55.00
1 7/16	33.54	34.74	35.94	37.14	38.33	39.53	40.73	41.93	57.50
1 1/2	35.00	36.25	37.50	38.75	40.00	41.25	42.50	43.75	60.00
1 9/16	36.46	37.76	39.06	40.36	41.67	42.97	44 27	45.57	62.50
1 5/8	37.92	39.27	40.63	41.98	43 33	44.69	46.04	47.40	65.00
1 11/16	39.38	40.78	42.19	43.59	45.00	46.41	47.81	49.22	67.50
1 3/4	40.83	42.29	43.75	45.21	46.67	48.13	49.58	51.04	70.00
1 13/16	42.29	43.80	45.31	46.82	48.33	49.84	51.35	52.86	72.50
1 7/8	43.75	45.31	46.88	48.44	50.00	51.56	53.13	54.69	75.00
1 15/16	45.21	46.82	48.44	50.05	51.67	53.28	54.90	56.51	77.50
2	46.67	48.33	50.00	51.67	53.33	55.00	56.67	58.33	80.00

WEIGHTS OF FLAT ROLLED IRON PER LINEAL FOOT.

(Continued.)

Thickness in Inches.	9″	9¼″	9½″	9¾″	10″	10¼″	10½″	10¾″	12″
1/16	1.88	1.93	1.98	2.03	2.08	2.14	2.19	2.24	2.50
1/8	3.75	3.85	3.96	4.06	4.17	4.27	4.38	4.48	5.00
3/16	5.63	5.78	5.94	6.09	6.25	6.41	6.56	6.72	7.50
1/4	7.50	7.71	7.92	8.13	8.33	8.54	8.75	8.96	10.00
5/16	9.38	9.64	9.90	10.16	10.42	10.68	10.94	11.20	12.50
3/8	11.25	11.56	11.88	12.19	12.50	12.81	13.13	13.44	15.00
7/16	13.13	13.49	13.85	14.22	14.58	14.95	15.31	15.68	17.50
1/2	15.00	15.42	15.83	16.25	16.67	17.08	17.50	17.92	20.00
9/16	16.88	17.34	17.81	18.28	18.75	19.22	19.69	20.16	22.50
5/8	18.75	19.27	19.79	20.31	20.83	21.35	21.88	22.40	25.00
11/16	20.63	21.20	21.77	22.34	22.92	23.49	24.06	24.64	27.50
3/4	22.50	23.13	23.75	24.38	25.00	25.62	26.25	26.88	30.00
13/16	24.38	25.05	25.73	26.41	27.08	27.76	28.44	29.11	32.50
7/8	26.25	26.98	27.71	28.44	29.17	29.90	30.63	31.35	35.00
15/16	28.13	28.91	29.69	30.47	31.25	32.03	32.81	33.59	37.50
1	30.00	30.83	31.67	32.50	33.33	34.17	35.00	35.83	40.00
1 1/16	31.88	32.76	33.65	34.53	35.42	36.30	37.19	38.07	42.50
1 1/8	33.75	34.69	35.63	36.56	37.50	38.44	39.38	40.31	45.00
1 3/16	35.63	36.61	37.60	38.59	39.58	40.57	41.56	42.55	47.50
1 1/4	37.50	38.54	39.58	40.63	41.67	42.71	43.75	44.79	50.00
1 5/16	39.38	40.47	41.56	42.66	43.75	44.84	45.94	47.03	52.50
1 3/8	41.25	42.40	43.54	44.69	45.83	46.98	48.13	49.27	55.00
1 7/16	43.13	44.32	45.52	46.72	47.92	49.11	50.31	51.51	57.50
1 1/2	45.00	46.25	47.50	48.75	50.00	51.25	52.50	53.75	60.00
1 9/16	46.88	48.18	49.48	50.78	52.08	53.39	54.69	55.99	62.50
1 5/8	48.75	50.10	51.46	52.81	54.17	55.52	56.88	58.23	65.00
1 11/16	50.63	52.03	53.44	54.84	56.25	57.66	59.06	60.47	67.50
1 3/4	52.50	53.96	55.42	56.88	58.33	59.79	61.25	62.71	70.00
1 13/16	54.38	55.89	57.40	58.91	60.42	61.93	63.44	64.95	72.50
1 7/8	56.25	57.81	59.38	60.94	62.50	64.06	65.63	67.19	75.00
1 15/16	58.13	59.74	61.35	62.97	64.58	66.20	67.81	69.43	77.50
2	60.00	61.67	63.35	65.00	66.67	68.33	70.00	71.67	80.00

WEIGHTS OF FLAT ROLLED IRON PER LINEAL FOOT.
(Continued.)

Thickness in Inches.	11″	11¼″	11½″	11¾″	12″	12¼″	12½″	12¾″
1/16	2.29	2.34	2.40	2.45	2.50	2.55	2.60	2.66
1/8	4.58	4.69	4.79	4.90	5.00	5.10	5.21	5.31
3/16	6.88	7.03	7.19	7.34	7.50	7.66	7.81	7.97
1/4	9.17	9.38	9.58	9.79	10.00	10.21	10.42	10.63
5/16	11.46	11.72	11.98	12.24	12.50	12.76	13.02	13.28
3/8	13.75	14.06	14.38	14.69	15.00	15.31	15.63	15.94
7/16	16.04	16.41	16.77	17.14	17.50	17.86	18.23	18.59
1/2	18.33	18.75	19.17	19.58	20.00	20.42	20.83	21.25
9/16	20.63	21.09	21.56	22.03	22.50	22.97	23.44	23.91
5/8	22.92	23.44	23.96	24.48	25.00	25.52	26.04	26.56
11/16	25.21	25.78	26.35	26.93	27.50	28.07	28.65	29.22
3/4	27.50	28.13	28.75	29.38	30.00	30.63	31.25	31.88
13/16	29.79	30.47	31.15	31.82	32.50	33.18	33.85	34.53
7/8	32.08	32.81	33.54	34.27	35.00	35.73	36.46	37.19
15/16	34.38	35.16	35.94	36.72	37.50	38.28	39.06	39.84
1	36.67	37.50	38.33	39.17	40.00	40.83	41.67	42.50
1 1/16	38.96	39.84	40.73	41.61	42.50	43.39	44.27	45.16
1 1/8	41.25	42.19	43.13	44.06	45.00	45.94	46.88	47.81
1 3/16	43.54	44.53	45.52	46.51	47.50	48.49	49.48	50.47
1 1/4	45.83	46.88	47.92	48.96	50.00	51.04	52.08	53.13
1 5/16	48.13	49.22	50.31	51.41	52.50	53.59	54.69	55.78
1 3/8	50.42	51.56	52.71	53.85	55.00	56.15	57.29	58.44
1 7/16	52.71	53.91	55.10	56.30	57.50	58.70	59.90	61.09
1 1/2	55.00	56.25	57.50	58.75	60.00	61.25	62.50	63.75
1 9/16	57.29	58.59	59.90	61.20	62.50	63.80	65.10	66.41
1 5/8	59.58	60.94	62.29	63.65	65.00	66.35	67.71	69.06
1 11/16	61.88	63.28	64.69	66.09	67.50	68.91	70.31	71.72
1 3/4	64.17	65.63	67.08	68.54	70.00	71.46	72.92	74.38
1 13/16	66.46	67.97	69.48	70.99	72.50	74.01	75.52	77.03
1 7/8	68.75	70.31	71.88	73.44	75.00	76.56	78.13	79.69
1 15/16	71.04	72.66	74.27	75.89	77.50	79.11	80.73	82.34
2	73.33	75.00	76.67	78.33	80.00	81.67	83.33	85.00

The weights for 12″ width are repeated on each page to facilitate making the additions necessary to obtain the weights of plates wider than 12″; thus to find the weight of 15¼″x⅛″, add the weights to be found in the same line for 3¼x⅛ and 12x⅛=9.48+35.00=44.48 lbs.

AREAS OF FLAT ROLLED IRON.

For Thicknesses from 1/16 in. to 2 in. and Widths from 1 in. to 12¾ ins.

Thickness in Inches.	1″	1¼″	1½″	1¾″	2″	2¼″	2½″	2¾″	12″
1/16	.063	.078	.094	.109	.125	.141	.156	.172	.75
1/8	.125	.156	.188	.219	.250	.281	.313	.344	1.50
3/16	.188	.234	.281	.328	.375	.422	.469	.516	2.25
1/4	.250	.313	.375	.438	.500	.563	.625	.688	3.00
5/16	.313	.391	.469	.547	.625	.703	.781	.859	3.75
3/8	.375	.469	.563	.656	.750	.844	.938	1.03	4.50
7/16	.438	.547	.656	.766	.875	.984	1.09	1.20	5.25
1/2	.500	.625	.750	.875	1.00	1.13	1.25	1.38	6.00
9/16	.563	.703	.844	.984	1.13	1.27	1.41	1.55	6.75
5/8	.625	.781	.938	1.09	1.25	1.41	1.56	1.72	7.50
11/16	.688	.859	1.03	1.20	1.38	1.55	1.72	1.89	8.25
3/4	.750	.938	1.13	1.31	1.50	1.69	1.88	2.06	9.00
13/16	.813	1.02	1.22	1.42	1.63	1.83	2.03	2.23	9.75
7/8	.875	1.09	1.31	1.53	1.75	1.97	2.19	2.41	10.50
15/16	.938	1.17	1.41	1.64	1.88	2.11	2.34	2.58	11.25
1	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	12.00
1 1/16	1.06	1.33	1.59	1.86	2.13	2.39	2.66	2.92	12.75
1 1/8	1.13	1.41	1.69	1.97	2.25	2.53	2.81	3.09	13.50
1 3/16	1.19	1.48	1.78	2.08	2.38	2.67	2.97	3.27	14.25
1 1/4	1.25	1.56	1.88	2.19	2.50	2.81	3.13	3.44	15.00
1 5/16	1.31	1.64	1.97	2.30	2.63	2.95	3.28	3.61	15.75
1 3/8	1.38	1.72	2.06	2.41	2.75	3.09	3.44	3.78	16.50
1 7/16	1.44	1.80	2.16	2.52	2.88	3.23	3.59	3.95	17.25
1 1/2	1.50	1.88	2.25	2.63	3.00	3.38	3.75	4.13	18.00
1 9/16	1.56	1.95	2.34	2.73	3.13	3.52	3.91	4.30	18.75
1 5/8	1.63	2.03	2.44	2.84	3.25	3.66	4.06	4.47	19.50
1 11/16	1.69	2.11	2.53	2.95	3.38	3.80	4.22	4.64	20.25
1 3/4	1.75	2.19	2.63	3.06	3.50	3.94	4.38	4.81	21.00
1 13/16	1.81	2.27	2.72	3.17	3.63	4.08	4.53	4.98	21.75
1 7/8	1.88	2.34	2.81	3.28	3.75	4.22	4.69	5.16	22.50
1 15/16	1.94	2.42	2.91	3.39	3.88	4.36	4.84	5.33	23.25
2	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	24.00

AREAS OF FLAT ROLLED IRON—(Continued.)

Thickness in Inches.	3″	3¼″	3½″	3¾″	4″	4¼″	4½″	4¾″	12″
1/16	.188	.203	.219	.234	.250	.266	.281	.297	.75
1/8	.375	.406	.438	.469	.500	.531	.563	.594	1.50
3/16	.563	.609	.656	.703	.750	.797	.844	.891	2.25
1/4	.750	.813	.875	.938	1.00	1.06	1.13	1.19	3.00
5/16	.938	1.02	1.09	1.17	1.25	1.33	1.41	1.48	3.75
3/8	1.13	1.22	1.31	1.41	1.50	1.59	1.69	1.78	4.50
7/16	1.31	1.42	1.53	1.64	1.75	1.86	1.97	2.08	5.25
1/2	1.50	1.63	1.75	1.88	2.00	2.13	2.25	2.38	6.00
9/16	1.69	1.83	1.97	2.11	2.25	2.39	2.53	2.67	6.75
5/8	1.88	2.03	2.19	2.34	2.50	2.66	2.81	2 97	7.50
11/16	2.06	2.23	2.41	2.58	2.75	2.92	3.09	3 27	8.25
3/4	2.25	2.44	2.63	2.81	3.00	3.19	3.38	3.56	9.00
13/16	2.44	2.64	2.84	3.05	3.25	3.45	3.66	3 86	9 75
7/8	2.63	2.84	3.06	3.28	3.50	3 72	3.94	4.16	10.50
15/16	2.81	3.05	3.28	3.52	3.75	3.98	4.22	4 45	11.25
1	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	12.00
1 1/16	3.19	3.45	3 72	3.98	4.25	4.52	4.78	5.05	12.75
1 1/8	3.38	3.66	3.94	4.22	4.50	4.78	5.06	5.34	13.50
1 3/16	3.56	3.86	4.16	4.45	4.75	5.05	5.34	5.64	14.25
1 1/4	3.75	4.06	4.38	4.69	5.00	5.31	5.63	5.94	15.00
1 5/16	3.94	4.27	4.59	4.92	5.25	5.58	5.91	6.23	15.75
1 3/8	4.13	4.47	4.81	5.16	5.50	5.84	6.19	6.53	16.50
1 7/16	4.31	4.67	5.03	5.39	5.75	6.11	6.47	6.83	17.25
1 1/2	4.50	4.88	5.25	5.63	6.00	6.38	6.75	7.13	18.00
1 9/16	4.69	5.08	5.47	5.86	6.25	6.64	7.03	7.42	18.75
1 5/8	4.88	5.28	5.69	6.09	6.50	6.91	7.31	7.72	19.50
1 11/16	5.06	5.48	5.91	6.33	6.75	7.17	7.59	8.02	20.25
1 3/4	5.25	5.69	6.13	6.56	7.00	7.44	7.88	8.31	21.00
1 13/16	5.44	5.89	6.34	6.80	7.25	7.70	8.16	8.61	21.75
1 7/8	5.63	6.09	6.56	7.03	7.50	7.97	8.44	8.91	22.50
1 15/16	5.81	6.30	6.78	7.27	7.75	8.23	8.72	9.20	23.25
2	6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	24.00

AREAS OF FLAT ROLLED IRON—(Continued.)

Thickness in Inches.	5″	5¼″	5½″	5¾″	6″	6¼″	6½″	6¾″	12″
1/16	.313	.328	.344	.359	.375	.391	.406	.422	.75
1/8	.625	.656	.688	.719	.750	.781	.813	.844	1.50
3/16	.938	.984	1.03	1.08	1.13	1.17	1.22	1.27	2.25
1/4	1.25	1.31	1.38	1.44	1.50	1.56	1.63	1.69	3.00
5/16	1.56	1.64	1.72	1.80	1.88	1.95	2.03	2.11	3.75
3/8	1.88	1.97	2.06	2.16	2.25	2.34	2.44	2.53	4.50
7/16	2.19	2.30	2.41	2.52	2.63	2.73	2.84	2.95	5.25
1/2	2.50	2.63	2.75	2.88	3.00	3.13	3.25	3.38	6.00
9/16	2.81	2.95	3.09	3.23	3.38	3.52	3.66	3.80	6.75
5/8	3.13	3.28	3.44	3.59	3.75	3.91	4.06	4.22	7.50
11/16	3.44	3.61	3.78	3.95	4.13	4.30	4.47	4.64	8.25
3/4	3.75	3.94	4.13	4.31	4.50	4.69	4.88	5.06	9.00
13/16	4.06	4.27	4.47	4.67	4.88	5.08	5.28	5.48	9.75
7/8	4.38	4.59	4.81	5.03	5.25	5.47	5.69	5.91	10.50
15/16	4.69	4.92	5.16	5.39	5.63	5.86	6.09	6.33	11.25
1	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	12.00
1 1/16	5.31	5.58	5.84	6.11	6.38	6.64	6.91	7.17	12.75
1 1/8	5.63	5.91	6.19	6.47	6.75	7.03	7.31	7.59	13.50
1 3/16	5.94	6.23	6.53	6.83	7.13	7.42	7.72	8.02	14.25
1 1/4	6.25	6.56	6.88	7.19	7.50	7.81	8.13	8.44	15.00
1 5/16	6.56	6.89	7.22	7.55	7.88	8.20	8.53	8.86	15.75
1 3/8	6.88	7.22	7.56	7.91	8.25	8.59	8 94	9.28	16.50
1 7/16	7.19	7.55	7.91	8.27	8.63	8.98	9.34	9.70	17.25
1 1/2	7.50	7.88	8.25	8.63	9.00	9.38	9.75	10.13	18.00
1 9/16	7.81	8.20	8.59	8.98	9.38	9.77	10.16	10.55	18.75
1 5/8	8.13	8.53	8.94	9.34	9.75	10.16	10.56	10.97	19.50
1 11/16	8.44	8.86	9.28	9.70	10.13	10.55	10.97	11.39	20.25
1 3/4	8.75	9.19	9.63	10.06	10.50	10.94	11.38	11.81	21.00
1 13/16	9.06	9.52	9.97	10.42	10.88	11.33	11.78	12.23	21.75
1 7/8	9.38	9.84	10.31	10.78	11.25	11.72	12.19	12.66	22.50
1 15/16	9.69	10.17	10.66	11.14	11.63	12.11	12.59	13.08	23.25
2	10.00	10.50	11.00	11.50	12.00	12.50	13.00	13.50	24.00

AREAS OF FLAT ROLLED IRON—(Continued.)

Thickness in Inches.	7″	7¼″	7½″	7¾″	8″	8¼″	8½″	8¾″	12″
1/16	.438	.453	.469	.484	.500	.516	.531	.547	.75
1/8	.875	.906	.938	.969	1.00	1.03	1.06	1.09	1.50
3/16	1.31	1.36	1.41	1.45	1.50	1.55	1.59	1.64	2.25
1/4	1.75	1.81	1.88	1.94	2.00	2.06	2.13	2.19	3.00
5/16	2.19	2.27	2.34	2.42	2.50	2.58	2.66	2.73	3.75
3/8	2.63	2.72	2.81	2.91	3.00	3.09	3.19	3.28	4.50
7/16	3.06	3.17	3.28	3.39	3.50	3.61	3.72	3.83	5.25
1/2	3.50	3.63	3.75	3.88	4.00	4.13	4.25	4.38	6.00
9/16	3.94	4.08	4.22	4.36	4.50	4.64	4.78	4.92	6.75
5/8	4.38	4.53	4.69	4.84	5.00	5.16	5.31	5.47	7.50
11/16	4.81	4.98	5.16	5.33	5.50	5.67	5.84	6.02	8.25
3/4	5.25	5.44	5.63	5.81	6.00	6.19	6.38	6.56	9.00
13/16	5.69	5.89	6.09	6.30	6.50	6.70	6.91	7.11	9.75
7/8	6.13	6.34	6.56	6.78	7.00	7.22	7.44	7.66	10.50
15/16	6.56	6.80	7.03	7.27	7.50	7.73	7.97	8.20	11.25
1	7.00	7.25	7.50	7.75	8.00	8.25	8.50	8.75	12.00
1 1/16	7.44	7.70	7.97	8.23	8.50	8.77	9.03	9.30	12.75
1 1/8	7.88	8.16	8.44	8.72	9.00	9.28	9.56	9.84	13.50
1 3/16	8.31	8.61	8.91	9.20	9.50	9.80	10.09	10.39	14.25
1 1/4	8.75	9.06	9.38	9.69	10.00	10.31	10.63	10.94	15.00
1 5/16	9.19	9.52	9.84	10.17	10.50	10.83	11.16	11.48	15.75
1 3/8	9.63	9.97	10.31	10.66	11.00	11.34	11.69	12.03	16.50
1 7/16	10.06	10.42	10.78	11.14	11.50	11.86	12.22	12.58	17.25
1 1/2	10.50	10.88	11.25	11.63	12.00	12.38	12.75	13.13	18.00
1 9/16	10.94	11.33	11.72	12.11	12.50	12.89	13.28	13.67	18.75
1 5/8	11.38	11.78	12.19	12.59	13.00	13.41	13.81	14.22	19.50
1 11/16	11.81	12.23	12.66	13.08	13.50	13.92	14.34	14.77	20.25
1 3/4	12.25	12.69	13.13	13.56	14.00	14.44	14.88	15.31	21.00
1 13/16	12.69	13.14	13.59	14.05	14.50	14.95	15.41	15.86	21.75
1 7/8	13.13	13.59	14.06	14.53	15.00	15.47	15.94	16.41	22.50
1 15/16	13.56	14.05	14.53	15.02	15.50	15.98	16.47	16.95	23.25
2	14.00	14.50	15.00	15.50	16.00	16.50	17.00	17.50	24.00

AREAS OF FLAT ROLLED IRON—(Continued).

Thickness in Inches.	9″	9¼″	9½″	9¾″	10″	10¼″	10½″	10¾″	12″
1/16	.563	.578	.594	.609	.625	.641	.656	.672	.75
1/8	1.13	1.16	1.19	1.22	1.25	1.28	1.31	1.34	1.50
3/16	1.69	1.73	1.78	1.83	1.88	1.92	1.97	2.02	2.25
1/4	2.25	2.31	2.38	2.44	2.50	2.56	2.63	2.69	3.00
5/16	2.81	2.89	2.97	3.05	3.13	3.20	3.28	3.36	3.75
3/8	3.38	3.47	3.56	3.66	3.75	3.84	3.94	4.03	4.50
7/16	3.94	4.05	4.16	4 27	4.38	4.48	4.59	4.70	5.25
1/2	4.50	4.63	4.75	4.88	5.00	5.13	5.25	5.38	6.00
9/16	5.06	5.20	5.34	5.48	5.63	5.77	5.91	6.05	6.75
5/8	5.63	5.78	5.94	6.09	6.25	6.41	6.56	6.72	7.50
11/16	6.19	6.36	6.53	6.70	6.88	7.05	7.22	7.39	8.25
3/4	6.75	6.94	7.13	7.31	7.50	7.69	7.88	8.06	9.00
13/16	7.31	7.52	7.72	7.92	8.13	8.33	8.53	8.73	9.75
7/8	7.88	8.09	8.31	8.53	8.75	8.97	9.19	9.41	10.50
15/16	8.44	8.67	8.91	9.14	9.38	9.61	9.84	10.08	11.25
1	9.00	9.25	9.50	9.75	10.00	10.25	10.50	10.75	12.00
1 1/16	9.56	9.83	10.09	10.36	10.63	10.89	11.16	11.42	12.75
1 1/8	10.13	10.41	10.69	10.97	11.25	11.53	11.81	12.09	13.50
1 3/16	10.69	10.98	11.28	11.58	11.88	12.17	12.47	12.77	14.25
1 1/4	11.25	11.56	11.88	12.19	12.50	12.81	13.13	13.44	15.00
1 5/16	11.81	12.14	12.47	12.80	13.13	13.45	13.78	14.11	15.75
1 3/8	12.38	12.72	13.06	13.41	13.75	14.09	14.44	14.78	16.50
1 7/16	12.94	13.30	13.66	14.02	14.38	14.73	15.09	15.45	17.25
1 1/2	13.50	13.88	14.25	14.63	15.00	15.38	15.75	16.13	18.00
1 9/16	14.06	14.45	14.84	15.23	15.63	16.02	16.41	16.80	18.75
1 5/8	14.63	15.03	15.44	15.84	16.25	16.66	17.06	17.47	19.50
1 11/16	15.19	15.61	16.03	16.45	16.88	17.30	17.72	18.14	20.25
1 3/4	15.75	16.19	16.63	17.06	17.50	17.94	18.38	18.81	21.00
1 13/16	16.31	16.77	17.22	17.67	18.13	18.58	19.03	19.48	21.75
1 7/8	16.88	17.34	17.81	18.28	18.75	19.22	19.69	20.16	22.50
1 15/16	17.44	17.92	18.41	18.89	19.38	19.86	20.34	20.83	23.25
2	18.00	18.50	19.00	19.50	20.00	20.50	21.00	21.50	24.00

AREAS OF FLAT ROLLED IRON—(Continued.)

Thickness in Inches.	11″	11¼″	11½″	11¾″	12″	12¼″	12½″	12¾″
1/16	.688	.703	.719	.734	.750	.766	.781	.797
1/8	1.38	1.41	1.44	1.47	1.50	1.53	1.56	1.59
3/16	2.06	2.11	2.16	2.20	2.25	2.30	2.34	2.39
1/4	2.75	2.81	2.88	2.94	3.00	3.06	3.13	3.19
5/16	3.44	3.52	3.59	3.67	3.75	3.83	3.91	3.98
3/8	4.13	4.22	4.31	4.41	4.50	4.59	4.69	4.78
7/16	4.81	4.92	5.03	5.14	5.25	5.36	5.47	5.58
1/2	5.50	5.63	5.75	5.88	6.00	6.13	6.25	6.38
9/16	6.19	6.33	6.47	6.61	6.75	6.89	7.03	7.17
5/8	6.88	7.03	7.19	7.34	7.50	7.66	7.81	7.97
11/16	7.56	7.73	7.91	8.08	8.25	8.42	8.59	8.77
3/4	8.25	8.44	8.63	8.81	9.00	9.19	9.38	9.56
13/16	8.94	9.14	9.34	9.55	9.75	9.95	10.16	10.36
7/8	9.63	9.84	10.06	10.28	10.50	10.72	10.94	11.16
15/16	10.31	10.55	10.78	11.02	11.25	11.48	11.72	11.95
1	11.00	11.25	11.50	11.75	12.00	12.25	12.50	12.75
1 1/16	11.69	11.95	12.22	12.48	12.75	13.02	13.28	13.55
1 1/8	12.38	12.66	12.94	13.22	13.50	13.78	14.06	14.34
1 3/16	13.06	13.36	13.66	13.95	14.25	14.55	14.84	15.14
1 1/4	13.75	14.06	14.38	14.69	15.00	15.31	15.63	15.94
1 5/16	14.44	14.77	15.09	15.42	15.75	16.08	16.41	16.73
1 3/8	15.13	15.47	15.81	16.16	16.50	16.84	17.19	17.53
1 7/16	15.81	16.17	16.53	16.89	17.25	17.61	17.97	18.33
1 1/2	16.50	16.88	17.25	17.63	18.00	18.38	18.75	19.13
1 9/16	17.19	17.58	17.97	18.36	18.75	19.14	19.53	19.92
1 5/8	17.88	18.28	18.69	19.09	19.50	19.91	20.31	20.72
1 11/16	18.56	18.98	19.41	19.83	20.25	20.67	21.09	21.52
1 3/4	19.25	19.69	20.13	20.56	21.00	21.44	21.88	22.31
1 13/16	19.94	20.39	20.84	21.30	21.75	22.20	22.66	23.11
1 7/8	20.63	21.09	21.56	22.03	22.50	22.97	23.44	23.91
1 15/16	21.31	21 80	22.28	22.77	23.25	23.73	24.22	24.70
2	22.00	22.50	23.00	23.50	24.00	24.50	25.00	25.50

The areas for 12″ width are repeated on each page to facilitate making the additions necessary to obtain the areas of plates wider than 12″. Thus, to find the area of 15¼″, add the areas to be found in the same line for 3¼ and 12×¼=2.84+10.50=13.34 square inches.

WEIGHTS AND AREAS OF SQUARE AND ROUND BARS OF WROUGHT IRON AND CIRCUMFERENCES OF ROUND BARS.

ONE CUBIC FOOT WEIGHING 480 LBS.

Thickness or Diameter in Inches.	Weight of □ Bar 1 ft. long.	Weight of ○ Bar 1 ft. long.	Area of □ Bar in Sq. Inches.	Area of ○ Bar in Sq. Inches.	Circumference of ○ Bar in Inches.
0					
1/16	.013	.010	.0039	.0031	.1963
1/8	.052	.041	.0156	.0123	.3927
3/16	.117	.092	.0352	.0276	.5890
1/4	.208	.164	.0625	.0491	.7854
5/16	.326	.256	.0977	.0767	.9817
3/8	.469	.368	.1406	.1104	1.1781
7/16	.638	.501	.1914	.1503	1.3744
1/2	.833	.654	.2500	.1963	1.5708
9/16	1.055	.828	.3164	.2485	1.7671
5/8	1.302	1.023	.3906	.3068	1.9635
11/16	1.576	1.237	.4727	.3712	2.1598
3/4	1.875	1.473	.5625	.4418	2.3562
13/16	2.201	1.728	.6602	.5185	2.5525
7/8	2.552	2.004	.7656	.6013	2.7489
15/16	2.930	2.301	.8789	.6903	2.9452
1	3.333	2.618	1.0000	.7854	3.1416
1/16	3.763	2.955	1.1289	.8866	3.3379
1/8	4.219	3.313	1.2656	.9940	3.5343
3/16	4.701	3.692	1.4102	1.1075	3.7306
1/4	5.208	4.091	1.5625	1.2272	3.9270
5/16	5.742	4.510	1.7227	1.3530	4.1233
3/8	6.302	4.950	1.8906	1 4849	4.3197
7/16	6.888	5.410	2.0664	1.6230	4.5160
1/2	7.500	5.890	2.2500	1.7671	4.7124
9/16	8.138	6.392	2.4414	1.9175	4.9087
5/8	8.802	6.913	2.6406	2.0739	5.1051
11/16	9.492	7.455	2.8477	2.2365	5.3014
3/4	10.21	8.018	3.0625	2.4053	5.4978
13/16	10.95	8.601	3.2852	2.5802	5.6941
7/8	11.72	9.204	3.5156	2.7612	5.8905
15/16	12.51	9.828	3.7539	2.9483	6.0868

SQUARE AND ROUND BARS—(Continued.)

Thickness or Diameter in Inches.	Weight of □ Bar 1 ft. long.	Weight of ○ Bar 1 ft. long.	Area of □ Bar in sq. inchs	Area of ○ Bar in sq. inchs	Circumference of ○ Bar in Inches.
2	13.33	10.47	4.0000	3.1416	6.2832
1/16	14.18	11.14	4.2539	3.3410	6.4795
1/8	15.05	11.82	4.5156	3.5466	6.6759
3/16	15.95	12.53	4.7852	3.7583	6.8722
1/4	16.88	13.25	5.0625	3.9761	7.0686
5/16	17.83	14.00	5.3477	4.2000	7.2649
3/8	18.80	14.77	5.6406	4.4301	7.4613
7/16	19.80	15.55	5.9414	4.6664	7.6576
1/2	20.83	16.36	6.2500	4.9087	7.8540
9/16	21.89	17.19	6.5664	5.1572	8.0503
5/8	22.97	18.04	6.8906	5.4119	8.2467
11/16	24.08	18.91	7.2227	5.6727	8.4430
3/4	25.21	19.80	7.5625	5.9396	8.6394
13/16	26.37	20.71	7.9102	6.2126	8.8357
7/8	27.55	21.64	8.2656	6.4918	9.0321
15/16	28.76	22.59	8.6289	6.7771	9.2284
3	30.00	23.56	9.0000	7.0686	9.4248
1/16	31.26	24.55	9.3789	7.3662	9.6211
1/8	32.55	25.57	9.7656	7.6699	9.8175
3/16	33.87	26.60	10.160	7.9798	10.014
1/4	35.21	27.65	10.563	8.2958	10.210
5/16	36.58	28.73	10.973	8.6179	10.407
3/8	37.97	29.82	11.391	8.9462	10.603
7/16	39.39	30.94	11.816	9.2806	10.799
1/2	40.83	32.07	12.250	9.6211	10.996
9/16	42.30	33.23	12.691	9.9678	11.192
5/8	43.80	34.40	13.141	10.321	11.388
11/16	45.33	35.60	13.598	10.680	11.585
3/4	46.88	36.82	14.063	11.045	11.781
13/16	48.45	38.05	14.535	11.416	11.977
7/8	50.05	39.31	15.016	11.793	12.174
15/16	51.68	40.59	15.504	12.177	12.370

SQUARE AND ROUND BARS—(Continued.)

Thickness or Diameter in Inches.	Weight of □ Bar 1 ft. long.	Weight of ○ Bar 1 ft. long.	Area of □ Bar in Sq. Inches.	Area of ○ Bar in Sq. Inches.	Circumference of ○ Bar in Inches.
4	53.33	41.89	16.000	12.566	12.566
1/16	55.01	43.21	16.504	12.962	12.763
1/8	56.72	44.55	17.016	13.364	12.959
3/16	58.45	45.91	17.535	13.772	13.155
1/4	60.21	47.29	18.063	14.186	13.352
5/16	61.99	48.69	18.598	14.607	13.548
3/8	63.80	50.11	19.141	15.033	13.744
7/16	65.64	51.55	19.691	15.466	13.941
1/2	67.50	53.01	20.250	15.904	14.137
9/16	69.39	54.50	20.816	16.349	14.334
5/8	71.30	56.00	21.391	16.800	14.530
11/16	73.24	57.52	21.973	17.257	14.726
3/4	75.21	59.07	22.563	17.721	14.923
13/16	77.20	60.63	23.160	18.190	15.119
7/8	79.22	62.22	23.766	18.665	15.315
15/16	81.26	63.82	24.379	19.147	15.512
5	83.33	65.45	25.000	19.635	15.708
1/16	85.43	67.10	25.629	20.129	15.904
1/8	87.55	68.76	26.266	20.629	16.101
3/16	89.70	70.45	26.910	21.135	16.297
1/4	91.88	72.16	27.563	21.648	16.493
5/16	94.08	73.89	28.223	22.166	16.690
3/8	96.30	75.64	28.891	22.691	16.886
7/16	98.55	77.40	29.566	23.221	17.082
1/2	100.8	79.19	30.250	23.758	17.279
9/16	103.1	81.00	30.941	24.301	17.475
5/8	105.5	82.83	31.641	24.850	17.671
11/16	107.8	84.69	32.348	25.406	17.868
3/4	110.2	86.56	33.063	25.967	18.064
13/16	112.6	88.45	33.785	26.535	18.261
7/8	115.1	90.36	34.516	27.109	18.457
15/16	117.5	92.29	35.254	27.688	18.653

SQUARE AND ROUND BARS—(Continued).

Thickness or Diameter in inches.	Weight of □ Bar 1 ft. long.	Weight of ○ Bar 1 ft. long.	Area of □ Bar in Sq. Inches.	Area of ○ Bar in Sq. inches.	Circumference of ○ Bar in Inches.
6	120.0	94.25	36.000	28.274	18.850
1/16	122.5	96.22	36.754	28.866	19.046
1/8	125.1	98.22	37.516	29.465	19.242
3/16	127.6	100.2	38.285	30.069	19.439
1/4	130.2	102.3	39.063	30.680	19.635
5/16	132.8	104.3	39.848	31.296	19.831
3/8	135.5	106.4	40.641	31.919	20.028
7/16	138.1	108.5	41.441	32.548	20.224
1/2	140.8	110.6	42.250	33.183	20.420
9/16	143.6	112.7	43.066	33.824	20.617
5/8	146.3	114.9	43.891	34.472	20.813
11/16	149.1	117.1	44.723	35.125	21.009
3/4	151.9	119.3	45.563	35.785	21.206
13/16	154.7	121.5	46.410	36.450	21.402
7/8	157.6	123.7	47.266	37.122	21.598
15/16	160.4	126.0	48.129	37.800	21.795
7	163.3	128.3	49.000	38.485	21.991
1/16	166.3	130.6	49.879	39.175	22.187
1/8	169.2	132.9	50.766	39.871	22.384
3/16	172.2	135.2	51.660	40.574	22.580
1/4	175.2	137.6	52.563	41.282	22.777
5/16	178.2	140.0	53.473	41.997	22.973
3/8	181.3	142.4	54.391	42.718	23.169
7/16	184.4	144.8	55.316	43.445	23.366
1/2	187.5	147.3	56.250	44.179	23.562
9/16	190.6	149.7	57.191	44.918	23.758
5/8	193.8	152.2	58.141	45.664	23.955
11/16	197.0	154.7	59.098	46.415	24.151
3/4	200.2	157.2	60.063	47.173	24.347
13/16	203.5	159.8	61.035	47.937	24.544
7/8	206.7	162.4	62.016	48.707	24.740
15/16	210.0	164.9	63.004	49.483	24.936

SQUARE AND ROUND BARS—(Continued.)

Thickness or Diameter in Inches.	Weight of □ Bar 1 ft. long.	Weight of ○ Bar 1 ft. long.	Area of □ Bar in Sq. Inches.	Area of ○ Bar in Sq. Inches.	Circumference of ○ Bar in Inches.
8	213.3	167.6	64.000	50.265	25.133
1/16	216.7	170.2	65.004	51.054	25.329
1/8	220.1	172.8	66.016	51.849	25.525
3/16	223.5	175.5	67.035	52.649	25.722
1/4	226.9	178.2	68.063	53.456	25.918
5/16	230.3	180.9	69.098	54.269	26.114
3/8	233.8	183.6	70.141	55.088	26.311
7/16	237.3	186.4	71.191	55.914	26.507
1/2	240.8	189.2	72.250	56.745	26.704
9/16	244.4	191.9	73.316	57.583	26.900
5/8	248.0	194.8	74.391	58.426	27.096
11/16	251.6	197.6	75.473	59.276	27.293
3/4	255.2	200.4	76.563	60.132	27.489
13/16	258.9	203.3	77.660	60.994	27.685
7/8	262.6	206.2	78.766	61.862	27.882
15/16	266.3	209.1	79.879	62.737	28.078
9	270.0	212.1	81.000	63.617	28.274
1/16	273.8	215.0	82.129	64.504	28.471
1/8	277.6	218.0	83.266	65.397	28.667
3/16	281.4	221.0	84.410	66.296	28.863
1/4	285.2	224.0	85.563	67.201	29.060
5/16	289.1	227.0	86.723	68.112	29.256
3/8	293.0	230.1	87.891	69.029	29.452
7/16	296.9	233.2	89.066	69.953	29.649
1/2	300.8	236.3	90.250	70.882	29.845
9/16	304.8	239.4	91.441	71.818	30.041
5/8	308.8	242.5	92.641	72.760	30.238
11/16	312.8	245.7	93.848	73.708	30.434
3/4	316.9	248.9	95.063	74.662	30.631
13/16	321.0	252.1	96.285	75.622	30.827
7/8	325.1	255.3	97.516	76.589	31.023
15/16	329.2	258.5	98.754	77.561	31.220

SQUARE AND ROUND BARS—(Continued.)

Thickness or Diameter in Inches.	Weight of □ Bar 1 ft. long.	Weight of ○ Bar 1 ft. long.	Area of □ Bar in Sq. Inches.	Area of ○ Bar in Sq. Inches.	Circumference of ○ Bar in Inches.
10	333.3	261.8	100.00	78.540	31.416
1/16	337.5	265.1	101.25	79.525	31.612
1/8	341.7	268.4	102.52	80.516	31.809
3/16	346.0	271.7	103.79	81.513	32.005
1/4	350.2	275.1	105.06	82.516	32.201
5/16	354.5	278.4	106.35	83.525	32.398
3/8	358.8	281.8	107.64	84.541	32.594
7/16	363.1	285.2	108.94	85.562	32.790
1/2	367.5	288.6	110.25	86.590	32.987
9/16	371.9	292.1	111.57	87.624	33.183
5/8	376.3	295.5	112.89	88.664	33.379
11/16	380.7	299.0	114.22	89.710	33.576
3/4	385.2	302.5	115.56	90.763	33.772
13/16	389.7	306.1	116.91	91.821	33.968
7/8	394.2	309.6	118.27	92.886	34.165
15/16	398.8	313.2	119.63	93.956	34.361
11	403.3	316.8	121.00	95.033	34.558
1/16	407.9	320.4	122.38	96.116	34.754
1/8	412.6	324.0	123.77	97.205	34.950
3/16	417.2	327.7	125.16	98.301	35.147
1/4	421.9	331.3	126.56	99.402	35.343
5/16	426.6	335.0	127.97	100.51	35.539
3/8	431.3	338.7	129.39	101.62	35.736
7/16	436.1	342.5	130.82	102.74	35.932
1/2	440.8	346.2	132.25	103.87	36.128
9/16	445.6	350.0	133.69	105.00	36.325
5/8	450.5	353.8	135.14	106.14	36.521
11/16	455.3	357.6	136.60	107.28	36.717
3/4	460.2	361.4	138.06	108.43	36.914
13/16	465.1	365.3	139.54	109.59	37.110
7/8	470.1	369.2	141.02	110.75	37.306
15/16	475.0	373.1	142.50	111.92	37.503

HALF ROUND, OVAL AND HALF OVAL.

Size Half Round.	Size Oval.	Weight Per Foot.	Size Half Oval.	Weight Per Foot.
3/8	3/8" x 3/16"	.186	3/8" x 3/32"	.093
7/16	7/16 x 7/32	.253	7/16 x 7/64	.127
1/2	1/2 x 1/4	.331	1/2 x 1/8	.166
5/8	5/8 x 5/16	.517	5/8 x 5/32	.259
3/4	3/4 x 3/8	.744	3/4 x 3/16	.372
7/8	7/8 x 7/16	1.013	7/8 x 7/32	.507
1	1 x 1/2	1.323	1 x 1/4	.662
1 1/8	1 1/8 x 9/16	1.624	1 1/8 x 9/32	.812
1 1/4	1 1/4 x 5/8	2.067	1 1/4 x 5/16	1.034
1 1/2	1 1/2 x 3/4	2.976	1 1/2 x 3/8	1.488
1 3/4	1 3/4 x 7/8	4.050	1 3/4 x 7/16	2.026
2	2 x1	5.290	2 x 1/2	2.645

NOTE.

The purest wrought iron has the greatest specific gravity, an average of 7.77, weight 485 lbs. per cubic foot. Large rolled bars, however, vary considerably; they have an average specific gravity of 7.6 and weight 474 lbs. per cubic foot. It is therefore usually assumed, for all practical purposes, to have an average specific gravity of 7.69 and an average weight per cubic foot of 480 lbs., and upon this basis the above calculations are made. Light weight of iron indicates impurities.

Basing calculations on the above, deduct 1/16 part to obtain the weight of cast iron; add 1/48 for steel; add 1/7 for copper; add 1/13 for cast brass; add 1/2 for lead, and deduct 1/12 for zinc.

SQUARE NUTS.

Table Showing the Average Number of Blank and Tapped Nuts in 100 Pounds.

UNITED STATES STANDARD SIZES.

Short Diam.	Thickness	Hole.	Size of Bolt.	Upson Nut Co. No. in 100 lbs.		Pa. Bolt & Nut Co. No. in 100 lbs.	
				Blank	Tapped	Blank	Tapped
1-2	1-4	3-16	1-4	6,900	9,700	7,410	8,500
19-32	5-16	1-4	5-16	3,800	5,900	4,000	5,000
11 16	3-8	19-64	3-8	2,550	3,250	2,740	3,000
25-32	7-16	11-32	7-16	1,650	2,230	1,695	2,000
7-8	1-2	13-32	1-2	1,240	1,485	1,266	1,300
31-32	9-16	29-64	9-16	870	1,050	918	1,000
1 1-16	5-8	33-64	5-8	712	730	685	710
1 1-4	3-4	5-8	3-4	428	424	408	410
1 7-16	7-8	47-64	7-8	277	285	265	285
1 5-8	1	27-32	1	186	188	190	188
1 13-16	1 1-8	15-16	1 1-8	136	142	134	142
2	1 1-4	1 1-16	1 1-4	100	101	98	101
2 3-16	1 3-8	1 5-32	1 3-8	75	75	71	75
2 3-8	1 1-2	1 9-32	1 1-2	58	62	60	62
2 9-16	1 5-8	1 13-32	1 5-8	48	48	46	48
2 3-4	1 3-4	1 1-2	1 3-4	38	38	38	38
2 15-16	1 7-8	1 5-8	1 7-8	31	31	30	31
3 1-8	2	1 23-32	2	27	26	26	26
3 5-16	2 1-8	1 27-32	2 1-8	.....	21	21	21
3 1-2	2 1-4	1 31-32	2 1-4	.....	18.5	17	18.5

HEXAGON NUTS.

Table Showing the Average Number of Blank and Tapped Nuts in 100 Pounds.

UNITED STATES STANDARD SIZES.

Short Diam.	Thickness.	Hole.	Size of Bolt.	Upson Nut Co. No. in 100 lbs.		Pa. Bolt and Nut Co. No. in 100 lbs.	
				Blank.	Tapped.	Blank.	Tapped.
1-2	1-4	3-16	1-4	8,000	10,500	9,999	9,500
19-32	5-16	1-4	5-16	4,600	6,500	4,762	6,000
11-16	3-8	19-64	3-8	2,950	3,660	3,279	3,300
25-32	7-16	11-32	7-16	2,000	2,630	2,041	2,300
7-8	1-2	13-32	1-2	1,450	1,780	1,390	1,650
31-32	9-16	29-64	9-16	1,034	1,280	1,081	1,230
1 1-16	5-8	33-64	5-8	766	890	781	840
1 1-4	3-4	5-8	3-4	485	520	463	520
1 7-16	7-8	47-64	7-8	314	340	317	340
1 5-8	1	27-32	1	218	231	216	231
1 13-16	1 1-8	15-16	1 1-8	158	165	146	165
2	1 1-4	1 1-16	1 1-4	118	122	115	122
2 3-16	1 3-8	1 5-32	1 3-8	91	90	84	90
2 3-8	1 1-2	1 9-32	1 1-2	73	74	65	74
2 9-16	1 5-8	1 13-32	1 5-8	63	58	52	58
2 3-4	1 3-4	1 1-2	1 3-4	47	46	42	46
2 15-16	1 7-8	1 5-8	1 7-8	40	38	35	38
3 1-8	2	1 23-32	2	31	31	29	31
3 5-16	2 1-8	1 13-16	2 1-8	.....	26	26	26
3 1-2	2 1-4	1 15-16	2 1-4	.....	21.5	23	21.5

WROUGHT OR STEEL WASHERS.

Diameter.	Size of Hole.	Thickness Wire Gauge No.	Size of Bolt.	Average No. in 100 lbs.
9-16	1-4	18	3-16	44,075
3-4	5-16	16	1-4	13,845
7-8	3-8	16	5-16	11,220
1	7-16	14	3-8	6,573
1 1-4	1-2	14	7-16	4,261
1 3-8	9-16	12	1-2	2,683
1 1-2	5-8	12	9-16	2,249
1 3-4	11-16	10	5-8	1,315
2	13-16	10	3-4	1,013
2 1-4	15-16	9	7-8	858
2 1-2	1 1-16	9	1	617
2 3-4	1 1-4	9	1 1-8	516
3	1 3-8	9	1 1-4	403
3 1-4	1 1-2	8	1 3-8	320
3 1-2	1 5-8	8	1 1-2	278
3 3-4	1 3-4	8	1 5-8	247
4	1 7-8	8	1 3-4	224
4 1-4	2	8	1 7-8	200
4 1-2	2 1-8	8	2	180
4 3-4	2 3-8	6	2 1-4	110
5	2 5-8	6	2 1-2	91

SQUARE WASHERS—Standard Sizes.

Width.	Thick.	Hole.	Bolt.	No. in 100 lbs
1 1-2	1-8	7-16	3-8	1,300
1 3-4	1-8	1-2	7-16	1,100
2	3-16	9-16	1-2	500
2 1-4	1-4	23-32	5-8	315
2 1-2	1-4	27-32	3-4	250
3	1-4	31-32	7-8	165
3 1-2	3-8	1 3-32	1	87
4	3-8	1 1-4	1 1-8	65
4 1-2	3-8	1 3-8	1 1-4	48
5	3-8	1 1-2	1 3-8	40
6	3-8	1 5-8	1 1-2	28

REVISED SCHEDULE CUT STEEL NAILS.

Size, Description, Length and Number per Pound.

Size.	Description.	Length. Inches.	No. of Nails to Pound.
2d	Fine blued	1	1050
3d	Fine blued	1⅛	825
3d	Fine polished	1⅛	825
2d	Common	1	800
3d	Common	1¼	480
4d	Common	1½	300
5d	Common	1¾	200
6d	Common	2	168
7d	Common	2¼	132
8d	Common	2½	95
9d	Common	2¾	80
10d	Common	3	64
12d	Common	3¼	50
16d	Common	3½	37
20d	Common	4	24
30d	Common	4½	16
40d	Common	5	14
50d	Common	5½	11
60d	Common	6	8
6d	Fence	2	80
7d	Fence	2¼	64
8d	Fence	2½	50
9d	Fence	2¾	40
10d	Fence	3	30
12d	Fence	3¼	27
16d	Fence	3½	21
20d	Fence	4	12
4d	Casing	1½	450
6d	Casing	2	210
8d	Casing	2½	134
10d	Casing	3	115
12d	Casing	3¼	100
16d	Casing	3½	78
20d	Casing	4	65
2d	Finishing	1	1200
3d	Finishing	1¼	900
4d	Finishing	1½	523
6d	Finishing	2	300
8d	Finishing	2½	208

CUT STEEL NAILS—(Continued.)

Size.	Description.	Length. Inches.	No. of Nails to Pound.
10d	Finishing	3	126
6d	Clinch	2	118
8d	Clinch	2½	80
10d	Clinch	3	52
12d	Clinch	3¼	43
¾ inch	Barrel	¾	800
⅞ "	Barrel	⅞	376
1 "	Barrel	1	300
1⅛ "	Barrel	1⅛	.....
1¼ "	Barrel	1¼	.....
1½ "	Barrel	1½	.....
2d	Slating	1	450
3d	Slating	1¼	350
4d	Slating	1½	250
5d	Slating	1¾	175
8d	Flooring brads	2½	110
4d	Box	1½	390
6d	Box	2	200
8d	Box	2½	140
¾ inch	Lining	¾	.....
⅞ "	Lining	⅞	.....
3 "	Cut spikes	3	26
3½ "	Cut spikes	3½	22
4 "	Cut spikes	4	15
4½ "	Cut spikes	4½	13
5 "	Cut spikes	5	10
5½ "	Cut spikes	5½	9
6 "	Cut spikes	6	7
3 "	Boat spikes	3	.....
3½ "	Boat spikes	3½	.....
4 "	Boat spikes	4	.....
4½ "	Boat spikes	4½	.....
5 "	Boat spikes	5	.....
5½ "	Boat spikes	5½	.....
6 "	Boat spikes	6	.....
6½ "	Boat spikes	6½	.....
7 "	Boat spikes	7	.....
7½ "	Boat spikes	7½	.....
8 "	Boat spikes	8	.....

STANDARD STEEL WIRE NAILS—(In Kegs.)

Common Nails.

Size.	Standard Gauge.	Average Number in One Pound.
2d Common	1 in. No. 15½	900
3d "	1¼ " 14½	615
4d "	1½ " 13	322
5d "	1¾ " 12½	254
6d "	2 " 12	200
7d "	2¼ " 11½	154
8d "	2½ " 10½	106
9d "	2¾ " 10	85
10d "	3 " 9½	74
12d "	3¼ " 9	57
16d "	3½ " 8	46
20d "	4 " 6	29
30d "	4½ " 5	23
40d "	5 " 4	17
50d "	5½ " 3	13½
60d "	6 " 2	10½

Fence Nails.

Size.	Standard Gauge.	Average Number in One Pound.
5d Fence	1¾ in. No. 10	127
6d "	2 " 10	114
7d "	2¼ " 9	88
8d "	2½ " 9	74
9d "	2¾ " 8	58
10d "	3 " 7	42
12d "	3¼ " 6	36
16d "	3½ " 5	28
20d "	4 " 4	22

STANDARD STEEL WIRE NAILS—(Continued.)

(In Kegs.)

Casing Nails.

Size.	Standard Gauge.	Average Number in One Pound.
2d Casing.....	1 in. No. 16	1140
3d "	1¼ " 15	675
4d "	1½ " 15	567
5d "	1¾ " 14	396
6d "	2 " 13	260
7d "	2¼ " 13	239
8d "	2½ " 12	160
9d "	2¾ " 12	148
10d "	3 " 11	108
12d "	3¼ " 11	99
16d "	3½ " 10	69
20d "	4 " 9	50
30d "	4½ " 9	45
40d "	5 " 8	35

Barbed Common Nails.

Size.	Standard Gauge.	Average Number in One Pound.
2d Barb Com'on	1 in. No. 15	860
3d "	1¼ " 14	594
4d "	1½ " 13	339
5d "	1¾ " 12	230
6d "	2 " 12	205
7d "	2¼ " 11	135
8d "	2½ " 10	96
9d "	2¾ " 10	92
10d "	3 " 9	63
12d "	3¼ " 8	52
16d "	3½ " 7	38
20d "	4 " 6	30
30d "	4½ " 5	23
40d "	5 " 4	17
50d "	5½ " 3	13½
60d "	6 " 2	10½

STANDARD STEEL WIRE NAILS—(Continued.)

(In Kegs.)

Shingle Nails.

Size.	Standard Gauge.	Average Number in One Pound.
3d Shingle.....	1¼ in. No. 13	380
4d "	1½ " 12	256
5d "	1¾ " 12	226
6d "	2 " 12	200
7d "	2¼ " 11	130
8d "	2½ " 11	120
9d "	2¾ " 11	115
10d "	3 " 10	79

Common Brads.

Size.	Standard Gauge.	Average Number in One Pound.
2d Common....	1 in. No. 15½	1142
3d "	1¼ " 14½	677
4d "	1½ " 13	342
5d "	1¾ " 12½	270
6d "	2 " 12	210
7d "	2¼ " 11½	162
8d "	2½ " 10½	112
9d "	2¾ " 10	90
10d "	3 " 9½	78
12d "	3¼ " 9	60
16d "	3½ " 8	49
20d "	4 " 6	30
30d "	4½ " 5	23
40d "	5 " 4	17
50d "	5½ " 3	14
60d "	6 " 2	11

STANDARD STEEL WIRE NAILS—(Continued.)

(In Kegs.)

Barbed Car Nails—Light.

Size.	Standard Gauge.	Average Number in One Pound.
4d Light Car . . .	1½ in. No. 12	260
5d " . . .	1¾ " 10	134
6d " . . .	2 " 10	119
7d " . . .	2¼ " 9	85
8d " . . .	2½ " 9	75
9d " . . .	2¾ " 8	58
10d " . . .	3 " 8	55
12d " . . .	3¼ " 7	43
16d " . . .	3½ " 7	39
20d " . . .	4 " 6	31
30d " . . .	4½ " 6	27
40d " . . .	5 " 5	21
50d " . . .	5½ " 4	18
60d " . . .	6 " 4	15

Barbed Car Nails—Heavy.

Size.	Standard Gauge.	Average Number in One Pound.
4d Heavy Car . .	1½ in. No. 10	164
5d " . .	1¾ " 9	103
6d " . .	2 " 9	91
7d " . .	2¼ " 8	73
8d " . .	2½ " 8	65
9d " . .	2¾ " 7	51
10d " . .	3 " 7	45
12d " . .	3¼ " 6	38
16d " . .	3½ " 6	34
20d " . .	4 " 5	26
30d " . .	4½ " 5	23
40d " . .	5 " 4	17
50d " . .	5½ " 3	14
60d " . .	6 " 3	13

STANDARD STEEL WIRE NAILS—(Continued.)

(In Kegs.)

Tobacco Nails.

Size.	Standard Gauge.	Average Number in One Pound.
4d Tobacco....	1½ in. No. 12	256
5d "	1¾ " 12	226
6d "	2 " 11	145
7d "	2¼ " 11	130
8d "	2½ " 10	100
9d "	2¾ " 10	85
10d "	3 " 9	65

Finishing Nails.

Size.	Standard Gauge.	Average Number in One Pound.
2d Finishing...	1 in. No. 17	1558
3d " ...	1¼ " 16	884
4d " ...	1½ " 16	767
5d " ...	1¾ " 15	491
6d " ...	2 " 14	359
7d " ...	2¼ " 14	317
8d " ...	2½ " 13	214
9d " ...	2¾ " 13	195
10d " ...	3 " 12	134
12d " ...	3¼ " 12	120
16d " ...	3½ " 11	91
20d " ...	4 " 10	61

STANDARD STEEL WIRE NAILS—(Continued.)

(In Kegs.)

Flooring Brads.

Size.	Standard Gauge.	Average Number in One Pound.
6d Flooring....	2 in. No. 11	151
7d "	2¼ " 11	136
8d "	2½ " 10	98
9d "	2¾ " 10	86
10d "	3 " 9	66
12d "	3¼ " 8	51
16d "	3½ " 7	40
20d "	4 " 6	29

Hinge Nails—Light.

Size.	Standard Gauge.	Average Number in One Pound.
4d Light Hinge	1½——3-16	76
6d "	2 ——3-16	58
8d "	2½——3-16	47
10d "	3 —— ¼	24
12d "	3¼—— ¼	22
16d "	3½—— ¼	20
20d "	4 —— ¼	18

Hinge Nails—Heavy.

Size.	Standard Gauge.	Average Number in One Pound.
4d Heavy Hinge	1½——¼	47
6d "	2 ——¼	36
8d "	2½——¼	28
10d "	3 ——⅜	11
12d "	3¼——⅜	10
16d "	3½——⅜	9½
20d "	4 ——⅜	8

STANDARD STEEL WIRE NAILS—(Continued.)

(In Kegs.)

Smooth Box Nails.

Size.	Standard Gauge.	Average Number in One Pound.
2d Box	1 -in. No. 16	1000
3d "	1¼ " 15	660
4d "	1½ " 15	550
5d "	1¾ " 14	366
6d "	2 " 13	250
7d "	2¼ " 13	236
8d "	2½ " 12	157
9d "	2¾ " 12	145
10d "	3 " 11	107
12d "	3¼ " 11	98
16d "	3½ " 10	65
20d "	4 " 9	45
30d "	4½ " 9	40
40d "	5 " 8	30

Barbed Nails, 15 cents per 100 lbs. extra.

Fine Nails.

Size.	Standard Gauge.	Average Number in One Pound.
2d Fine	1 -in. No. 17	1440
3d "	1⅛ " 15½	810
4d "	1½ " 15	550

Slating Nails.

Size.	Standard Gauge.	Average Number in One Pound.
2d Slating	1 in. No. 12	385
3d "	1¼ " 11	230
4d "	1½ " 11	198
5d "	1¾ " 10	125
6d "	2 " 10	112

STANDARD STEEL WIRE NAILS—(Continued.)

(In Kegs.)

Clinch Nails.

Size.	Standard Gauge.	Average Number in One Pound.
2d Clinch	1 -in. No. 14	622
3 "	1¼ " 13	412
4 "	1½ " 12	267
5 "	1¾ " 12	230
6 "	2 " 11	156
7 "	2¼ " 11	110
8 "	2½ " 10	98
9 "	2¾ " 10	86
10 "	3 " 9	66
12 "	3¼ " 9	57
16 "	3½ " 8	46
20 "	4 " 7	35

Spikes.

Size.	Standard Gauge.	Average Number in One Pound.
10d Spike.	3 -in. No. 6	37
16d "	3½ " 5	29
20d "	4 " 4	23
30d "	4½ " 3	18
40d "	5 " 2	13
50d "	5½ " 1	10
60d "	6 " 1	9
6½-in. "	6½ " 0	7½
7 " "	7 " 0	6½
8 " "	8 " 00	4¼
9 " "	9 " 00	3⅔
10 " "	10 " 00	3¼
12 " "	12 " 00	2¾

STANDARD STEEL WIRE NAILS—(Continued.)

Barbed Roofing Nails.

Size.	Standard Gauge.	Average Number in One Pound.
¾-in Barb Roof	¾-in. No. 13	648
⅞ "	⅞ " 12	413
1 "	1 " 12	384
1⅛ "	1⅛ " 12	339
1¼ "	1¼ " 11	231
1½ "	1½ " 10	154
1¾ "	1¾ " 10	135
2 "	2 " 9	90

Barrel Nails.

Size.	Standard Gauge.	Average Number in One Pound.
¾-in. Barrel . . .	¾-in. No. 15½	940
⅞ " . . .	⅞ " 14½	804
1 " . . .	1 " 14½	620
1⅛ " . . .	1⅛ " 14½	590
1¼ " . . .	1¼ " 14	542
1⅜ " . . .	1⅜ " 13	365
1½ " . . .	1½ " 13	322

Lining Nails.

Size.	Standard Gauge.	Average Number in One Pound.
¾-in Lining . . .	¾-in. No. 17	1930
⅞ " . . .	⅞ " 17	1660
1 " . . .	1 " 17	1440

FLAT HEAD BRIGHT IRON SCREWS.

Flat head iron wood screws are made of the following lengths and sizes:

Length.		Size.			
¼	inch....	From	0	to	4
⅜	"	"	0	"	9
½	"	"	1	"	12
⅝	"	"	1	"	14
¾	"	"	2	"	16
⅞	"	"	2	"	16
1	"	"	3	"	20
1¼	"	"	4	"	24
1½	"	"	4	"	24
1¾	"	"	6	"	24
2	"	"	6	"	24
2¼	"	"	8	"	24
2½	"	"	8	"	24
2¾	"	"	10	"	24
3	"	"	10	"	26
3½	"	"	10	"	26
4	"	"	12	"	26
4½	"	"	16	"	26
5	"	"	18	"	28
6	"	"	20	"	30

FLAT OR ROUND HEAD BRASS SCREWS.

Length.		Size.			
¼	inch....	From	0	to	4
⅜	"	"	0	"	7
½	"	"	1	"	10
⅝	"	"	2	"	12
¾	"	"	2	"	16
⅞	"	"	2	"	16
1	"	"	3	"	17
1¼	"	"	3	"	20
1½	"	"	4	"	20
1¾	"	"	6	"	24
2	"	"	6	"	24
2¼	"	"	8	"	22
2½	"	"	10	"	24
3	"	"	10	"	26

UNITED STATES STANDARD GAUGE.

For Sheet and Plate Iron and Steel.

(Copied.)

(Public—No. 137.)

An Act establishing a standard gauge for sheet and plate iron and steel.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That for the purpose of securing uniformity the following is established as the only standard gauge for sheet and plate iron and steel in the United States of America, namely:

Number of Gauge.	Weight. Sq. ft. in lbs Avoir.	Weight Per Sq. Ft. in Oz. Avoir.	Approximate Thickness in Decimal Parts of an Inch,	Approximate Thickness in Fractions of an Inch.
0000000	20.00	320	.5	1-2
000000	18.75	300	.46875	15-32
00000	17.50	280	.4375	7-16
0000	16.25	260	.40625	13-32
000	15.	240	.375	3-8
00	13.75	220	.34375	11-32
0	12.50	200	.3125	5-16
1	11.25	180	.28125	9-32
2	10.625	170	.265625	17-64
3	10.	160	.25	1-4
4	9.375	150	.234375	15-64
5	8.75	140	.21875	7-32
6	8.125	130	.203125	13-64
7	7.5	120	.1875	3-16
8	6.875	110	.171875	11-64
9	6.25	100	.15625	5-32
10	5.625	90	.140625	9-64
11	5.	80	.125	1-8
12	4.375	70	.109375	7-64
13	3.75	60	.09375	3-32
14	3.125	50	.078125	5-64
15	2.8125	45	.0703125	9-128

GAUGES FOR SHEET AND PLATE IRON—(Continued.)

Number of Gauge.	Weight Per Sq. Ft. in lbs. Avoir.	Weight Per Sq. Ft. in Oz. Avoir.	Approximate Thickness in Decimal Parts of an Inch.	Approximate Thickness in Fractions of an Inch.
16	2.5	40	.0625	1-16
17	2.25	36	.05625	9-160
18	2.	32	.05	1-20
19	1.75	28	.04375	7-160
20	1.50	24	.0375	3-80
21	1.375	22	.034375	11-320
22	1.25	20	.03125	1-32
23	1.125	18	.028125	9-320
24	1.	16	.025	1-40
25	.875	14	.021875	7-320
26	.75	12	.01875	3-160
27	.6875	11	.0171875	11-640
28	.625	10	.015625	1-64
29	.5625	9	.0140625	9-640
30	.5	8	.0125	1-80
31	.4375	7	.0109375	7-640
32	.40625	6½	.01015625	13-1280
33	.375	6	.009375	3-320
34	.34375	5½	.00859375	11-1280
35	.3125	5	.0078125	5-640
36	.28125	4½	.00703125	9-1280
37	.265625	4¼	.006640625	17-2560
38	.25	4	.00625	1-160

On and after July first, eighteen hundred and ninety-three, the same and no other shall be used in determining duties and taxes levied by the United States of America on sheet and plate iron and steel. But this act shall not be construed to increase duties upon any articles which may be imported.

SEC. 2. That the Secretary of the Treasury is authorized and required to prepare suitable standards in accordance herewith.

SEC. 3. That in the practical use and application of the standard gauge hereby established, a variation of two and one-half per cent. either way may be allowed.

Approved, March 3rd, 1893.

STANDARD GAUGES FOR BLACK SHEETS.

(Adopted by Congress March 3, 1893.)

Except for special purposes, black sheets are rolled to the following thicknesses :

No. of Gauge.	THICKNESS.		WEIGHT.	
	Approximate thickness in fractions of an inch.	Approximate thickness in decimal parts of an inch.	Weight per square ft. in ounces avoirdupois.	Weight per square ft. in pounds, avoirdupois.
10	9-64	.140625	90	5.625
11	1-8	.125	80	5.
12	7-64	.109375	70	4.375
13	3-32	.09375	60	3.75
14	5-64	.078125	50	3.125
15	9-128	.0703125	45	2.8125
16	1-16	.0625	40	2.5
17	9-160	.05625	36	2.25
18	1-20	.05	32	2.
19	7-160	.04375	28	1.75
20	3-80	.0375	24	1.50
21	11-320	.034375	22	1.375
22	1-32	.03125	20	1.25
23	9-320	.028125	18	1.125
24	1-40	.025	16	1.
25	7-320	.021875	14	.875
26	3-160	.01875	12	.75
27	11-640	.0171875	11	.6875
28	1-64	.015625	10	.625
29	9-640	.0140625	9	.5625
30	1-80	.0125	8	.5
31	7-640	.0109375	7	.4375
32	13-1280	.01015625	6 1-2	.40625

A variation of two and one-half per cent. either way is allowed.

WEIGHT OF CORRUGATED SHEETS PER SQUARE, OR 100 SQUARE FEET, IN POUNDS.

	BLACK.		GALVANIZED.	
Gauge Number.	2½ Inch Corrugations.	1¼ Inch Corrugations.	2½ Inch Corrugations.	1¼ Inch Corrugations.
20	167	170	184	187
21	153	156	170	173
22	139	142	156	159
23	125	127	142	145
24	111	113	128	131
25	97	99	115	117
26	83	85	101	103
27	76	78	94	96
28	69	71	87	88

If the material is to be painted, add to the above weights 2 pounds per square for paint.

Terne plate roofing in special large sizes up to 120 inches long in standard widths.

Corrugated sheets, galvanized and black, plain and painted
2½ inch corrugations,
1¼ inch corrugations.

NUMBER OF CORRUGATED SHEETS IN ONE SQUARE (100 SQ. FT.)

Length of Sheet. (Inches.)	2½ Inch Corrugations. Width (flat) 30 Inches. Width (After Corrugating) 27 Inches. Covering Width (Allowing for Laps) 24 Inches.	1¼ Inch Corrugations. Width (flat) 30 Inches. Width (After Corrugating) 26 Inches. Covering Width (Allowing for Laps) 24½ Ins.
60	8.888	9.231
72	7.407	7.692
84	6.349	6.593
96	5.555	5.769
108	4.938	5.128
120	4.444	4.616

GUARANTEED GALVANIZED IRON PRICE LIST.

(Adopted July 1st, 1893.)

Gauge No.	Weight Per Sq. Ft. Ounces.	Price Per lb. Cents.	Gauge No.	Weight Per Sq. Ft. Ounces.	Price Per lb. Cents.
10	92.5		22	22.5	
11	82.5		23	20.5	14
12	72.5		24	18.5	
13	62.5	12			
14	52.5		25	16.5	
15	47.5		26	14.5	15
16	42.5				
17	38.5		27	13.5	16
18	34.5		28	12.5	17
19	30.5	13	29	11.5	19
20	26.5		30	10.5	21
21	24.5				

ADDITIONAL PRICES ON EXTRA SIZES OF GUARANTEED GALVANIZED IRON.

EXTRA WIDTHS.

Numbers 16, 17 and 18. — Per Pound.

Over 36 inches to 40 inches.....1 cent.
Over 40 inches to 44 inches.....1½ cents.
Over 44 inches to 48 inches.....2½ cents.

Number 19 and Lighter.

Less than 24 inches wide.....1 cent.
Over 32 inches to 36 inches.....1 cent.
Over 36 inches to 40 inches.....2 cents.
Over 40 inches to 44 inches.....3 cents.
Over 44 inches to 48 inches.....5 cents.

EXTRA LENGTHS.

Longer than 120 inches.....1 cent.

One-half cent per pound additional for Pattern Sheets, i. e. for all iron of which every sheet in each bundle is required to be of exact length specified, or where iron is ordered in sheets, all of which are required to be of the same length. But iron of any length in bundles, in which one or two sheets of the same number and width, but shorter than the full length ordered, are allowed to be put up in each bundle, will be considered ordinary length, or merchant iron, and will not be subject to any extra for length.

NET PRICES

OF

GALVANIZED SHEETS.

Number of Gauge		10	11	12	13
List price per lb. (cts.)...		12	12	12	12
Weight per sq. ft. (oz.)...		92.5	82.5	72.5	62.5
Weight per sq. ft. (lbs.)..		5.781	5.156	4.531	3.906
Discounts (per cent.)					
65—5	lb.	3·99	3·99	3·99	3·99
	sq. ft.	23.07	20.57	18.08	15.59
62½—7½—5	lb.	3·95	3·95	3·95	3·95
	sq. ft.	22.84	20.37	17.90	15.43
67½	lb.	3·90	3·90	3·90	3·90
	sq. ft.	22.55	20.11	17.67	15.23
62½—10—5	lb.	3·85	3·85	3·85	3·85
	sq. ft.	22.26	19.85	17.45	15.04
67½—2½	lb.	3·80	3·80	3·80	3·80
	sq. ft.	21.97	19.59	17.22	14.84
62½—10—5—2½ .	lb.	3·75	3·75	3·75	3·75
	sq. ft.	21.68	19.34	16.99	14.65
65—5—5—2	lb.	3·71	3·71	3·71	3·71
	sq. ft.	21.45	19.13	16.81	14.49
67½—5	lb.	3·71	3·71	3·71	3·71
	sq. ft.	21.45	19.13	16.81	14.49
65—12½	lb.	3·68	3·68	3·68	3·68
	sq. ft.	21.27	18.97	16.67	14.37
67½—5—2	lb.	3·63	3·63	3·63	3·63
	sq. ft.	20.99	18.72	16.45	14.18
70	lb.	3·60	3·60	3·60	3·60
	sq. ft.	20.81	18.56	16.31	14.06
62½—10—10—2 ..	lb.	3·57	3·57	3·57	3·57
	sq. ft.	20.64	18.41	16.18	13.95
62½—10—10—2½	lb.	3·55	3·55	3·55	3·55
	sq. ft.	20.55	18.30	16.09	13.87
70—2	lb.	3·53	3·53	3·53	3·53
	sq. ft.	20.41	18.20	16.00	13.79
70—2½	lb.	3·51	3·51	3·51	3·51
	sq. ft.	20.29	18.10	15.90	13.71
70—2—2	lb.	3·46	3·46	3·46	3·46
	sq. ft.	20.00	17.84	15.68	13.52
70—2½—2	lb.	3·44	3·44	3·44	3·44
	sq. ft.	19.89	17.74	15.59	13.44
70—5	lb.	3·42	3·42	3·42	3·42
	sq. ft.	19.77	17.63	15.50	13.36
65—12½—7½ ...	lb.	3·40	3·40	3·40	3·40
	sq. ft.	19.66	17.53	15.41	13.28
70—5—2	lb.	3·35	3·35	3·35	3·35
	sq. ft.	19.37	17.27	15.18	13.09

GALVANIZED SHEETS (cents)

14 12 52.5 3.281	15 12 47.5 2.969	16 12 42.5 2.656	17 13 38.5 2.406	18 13 34.5 2.156	19 13 30.5 1.906	20 13 26.5 1.656
3.99 13.09	3.99 11.85	3.99 10.60	4.32 10.40	4.32 9.31	4.32 8.23	4.32 7.15
3.95 12.96	3.95 11.73	3.95 10.49	4.28 10.30	4.28 9.23	4.28 8.16	4.28 7.09
3.90 12.80	3.90 11.58	3.90 10.36	4.23 10.18	4.23 9.12	4.23 8.06	4.23 7.01
3.85 12.63	3.85 11.43	3.85 10.23	4.17 10.03	4.17 8.99	4.17 7.95	4.17 6.91
3.80 12.47	3.80 11.28	3.80 10.09	4.12 9.91	4.12 8.88	4.12 7.85	4.12 6.82
3.75 12.30	3.75 11.13	3.75 9.96	4.06 9.77	4.06 8.75	4.06 7.74	4.06 6.72
3.71 12.17	3.71 11.01	3.71 9.85	4.02 9.67	4.02 8.67	4.02 7.66	4.02 6.66
3.71 12.17	3.71 11.01	3.71 9.85	4.01 9.65	4.01 8.65	4.01 7.64	4.01 6.64
3.68 12.07	3.68 10.92	3.68 9.77	3.98 9.58	3.98 8.58	3.98 7.59	3.98 6.59
3.63 11.91	3.63 10.78	3.63 9.64	3.93 9.46	3.93 8.47	3.93 7.49	3.93 6.51
3.60 11.81	3.60 10.69	3.60 9.56	3.90 9.38	3.90 8.41	3.90 7.43	3.90 6.46
3.57 11.71	3.57 10.60	3.57 9.48	3.87 9.31	3.87 8.34	3.87 7.38	3.87 6.41
3.55 11.65	3.55 10.54	3.55 9.43	3.85 9.26	3.85 8.30	3.85 7.34	3.85 6.38
3.53 11.58	3.53 10.48	3.53 9.38	3.82 9.19	3.82 8.24	3.82 7.28	3.82 6.33
3.51 11.52	3.51 10.42	3.51 9.32	3.80 9.14	3.80 8.19	3.80 7.24	3.80 6.29
3.46 11.35	3.46 10.27	3.46 9.19	3.75 9.02	3.75 8.09	3.75 7.15	3.75 6.21
3.44 11.29	3.44 10.21	3.44 9.14	3.72 8.95	3.72 8.02	3.72 7.09	3.72 6.16
3.42 11.22	3.42 10.15	3.42 9.08	3.71 8.93	3.71 8.00	3.71 7.07	3.71 6.14
3.40 11.16	3.40 10.09	3.40 9.03	3.68 8.85	3.68 7.93	3.68 7.01	3.68 6.09
3.35 10.99	3.35 9.95	3.35 8.90	3.63 8.73	3.63 7.83	3.63 6.92	3.63 6.01

Number of Gauge		21	22	23
List price per lb. (cts.)		13	14	14
Weight per sq. ft. (oz.)		24.5	22.5	20.5
Weight per sq. ft. (lbs.)		1.531	1.406	1.281
Discounts (per cent.)				
65—5	lb.	4.32	4.65	4.66
	sq. ft.	6.61	6.55	5.97
62½—7½—5	lb.	4.28	4.61	4.61
	sq. ft.	6.55	6.48	5.91
67½	lb.	4.23	4.55	4.55
	sq. ft.	6.48	6.40	5.83
62½—10—5	lb.	4.17	4.49	4.49
	sq. ft.	6.39	6.31	5.75
67½—2½	lb.	4.12	4.44	4.44
	sq. ft.	6.31	6.24	5.69
62½—10—5—2½	lb.	4.06	4.38	4.38
	sq. ft.	6.22	6.16	5.61
65—5—5—2	lb.	4.02	4.33	4.33
	sq. ft.	6.16	6.09	5.55
67½—5	lb.	4.01	4.32	4.32
	sq. ft.	6.14	6.07	5.53
65—12½	lb.	3.98	4.29	4.29
	sq. ft.	6.09	6.03	5.50
67½—5—2	lb.	3.93	4.24	4.24
	sq. ft.	6.02	5.96	5.43
70	lb.	3.90	4.20	4.20
	sq. ft.	5.97	5.91	5.38
62½—10—10—2	lb.	3.87	4.17	4.17
	sq. ft.	5.93	5.86	5.34
62½—10—10—2½	lb.	3.85	4.15	4.15
	sq. ft.	5.90	5.84	5.32
70—2	lb.	3.82	4.12	4.12
	sq. ft.	5.85	5.79	5.28
70—2½	lb.	3.80	4.10	4.10
	sq. ft.	5.82	5.77	5.25
70—2—2	lb.	3.75	4.03	4.03
	sq. ft.	5.74	5.67	5.16
70—2½—2	lb.	3.72	4.01	4.01
	sq. ft.	5.70	5.64	5.14
70—5	lb.	3.71	3.99	3.99
	sq. ft.	5.68	5.61	5.11
65—12½—7½	lb.	3.68	3.97	3.97
	sq. ft.	5.63	5.58	5.09
70—5—2	lb.	3.63	3.91	3.91
	sq. ft.	5.56	5.50	5.01

GALVANIZED SHEETS (cents)

24 14 18.5 1.156	25 15 16.5 1.031	26 15 14.5 .9062	27 16 13.5 .8437	28 17 12.5 .7812	29 19 11.5 .7187	30 21 10.5 .6562
4.66 **5.39**	4.99 **5.15**	4.99 **4.52**	5.32 **4.49**	5.65 **4.41**	6.32 **4.54**	6.98 **4.58**
4.61 **5.33**	4.94 **5.09**	4.94 **4.48**	5.27 **4.45**	5.60 **4.38**	6.26 **4.50**	6.92 **4.54**
4.55 **5.26**	4.88 **5.03**	4.88 **4.42**	5.20 **4.39**	5.53 **4.32**	6.18 **4.44**	6.83 **4.48**
4.49 **5.19**	4.81 **4.96**	4.81 **4.36**	5.13 **4.33**	5.45 **4.26**	6.09 **4.38**	6.73 **4.42**
4.44 **5.13**	4.75 **4.90**	4.75 **4.30**	5.07 **4.28**	5.39 **4.21**	6.02 **4.33**	6.65 **4.36**
4.38 **5.06**	4.69 **4.84**	4.69 **4.25**	5.00 **4.22**	5.31 **4.15**	5.94 **4.27**	6.56 **4.31**
4.33 **5.01**	4.64 **4.78**	4.64 **4.21**	4.95 **4.18**	5.26 **4.11**	5.88 **4.23**	6.50 **4.27**
4.32 **4.99**	4.63 **4.77**	4.63 **4.20**	4.94 **4.17**	5.25 **4.10**	5.87 **4.22**	6.48 **4.25**
4.29 **4.96**	4.59 **4.73**	4.59 **4.16**	4.90 **4.13**	5.21 **4.07**	5.82 **4.18**	6.43 **4.22**
4.24 **4.90**	4.54 **4.68**	4.54 **4.11**	4.84 **4.08**	5.14 **4.02**	5.75 **4.13**	6.35 **4.17**
4.20 **4.86**	4.50 **4.64**	4.50 **4.08**	4.80 **4.05**	5.10 **3.98**	5.70 **4.10**	6.30 **4.13**
4.17 **4.82**	4.47 **4.61**	4.47 **4.05**	4.76 **4.02**	5.06 **3.95**	5.66 **4.07**	6.25 **4.10**
4.15 **4.80**	4.44 **4.58**	4.44 **4.02**	4.74 **4.00**	5.03 **3.93**	5.63 **4.05**	6.22 **4.08**
4.12 **4.76**	4.41 **4.55**	4.41 **4.00**	4.70 **3.97**	5.00 **3.91**	5.59 **4.02**	6.17 **4.05**
4.10 **4.74**	4.39 **4.53**	4.39 **3.98**	4.68 **3.95**	4.97 **3.88**	5.56 **4.00**	6.14 **4.03**
4.03 **4.66**	4.32 **4.45**	4.32 **3.91**	4.61 **3.89**	4.90 **3.83**	5.47 **3.93**	6.05 **3.97**
4.01 **4.64**	4.30 **4.43**	4.30 **3.90**	4.59 **3.87**	4.87 **3.80**	5.45 **3.92**	6.02 **3.95**
3.99 **4.61**	4.28 **4.41**	4.28 **3.88**	4.56 **3.85**	4.85 **3.79**	5.42 **3.90**	5.99 **3.93**
3.97 **4.59**	4.25 **4.38**	4.25 **3.85**	4.53 **3.82**	4.82 **3.77**	5.38 **3.87**	5.95 **3.90**
3.91 **4.52**	4.19 **4.32**	4.19 **3.80**	4.47 **3.77**	4.75 **3.71**	5.31 **3.82**	5.87 **3.85**

Number of Gauge		10	11	12	13
List price per lb. (cts.)...		12	12	12	12
Weight per sq. ft. (oz.)...		92.5	82.5	72.5	62.5
Weight per sq. ft. (lbs.)..		5.781	5.156	4.531	3.906
Discounts (per cent.)					
70—5—2½	lb.	3.33	3.33	3.33	3.33
	sq. ft.	19.25	17.17	15.09	13.01
65—20—2	lb.	3.29	3.29	3.29	3.29
	sq. ft.	19.02	16.96	14.91	12.85
65—20—2½	lb.	3.28	3.28	3.28	3.28
	sq. ft.	18.96	16.91	14.86	12.81
70—5—5	lb.	3.25	3.25	3.25	3.25
	sq. ft.	18.79	16.76	14.73	12.70
70—10	lb.	3.24	3.24	3.24	3.24
	sq. ft.	18.73	16.71	14.68	12.66
66⅔—15—5	lb.	3.23	3.23	3.23	3.23
	sq. ft.	18.67	16.65	14.64	12.62
65—15—10	lb.	3.21	3.21	3.21	3.21
	sq. ft.	18.56	16.55	14.55	12.54
65—20—5	lb.	3.19	3.19	3.19	3.19
	sq. ft.	18.44	16.45	14.45	12.46
70—5—5—2	lb.	3.18	3.18	3.18	3.18
	sq. ft.	18.38	16.40	14.41	12.42
70—10—2	lb.	3.18	3.18	3.18	3.18
	sq. ft.	18.38	16.40	14.41	12.42
70—7½—5	lb.	3.16	3.16	3.16	3.16
	sq. ft.	18.27	16.30	14.32	12.34
70—10—2½	lb.	3.16	3.16	3.16	3.16
	sq. ft.	18.27	16.30	14.32	12.34
70—10—3	lb.	3.14	3.14	3.14	3.14
	sq. ft.	18.15	16.19	14.23	12.27
72½—5	lb.	3.14	3.14	3.14	3.14
	sq. ft.	18.15	16.19	14.23	12.27
70—10—2—2	lb.	3.11	3.11	3.11	3.11
	sq. ft.	17.98	16.04	14.09	12.15
70—10—2½—2 ...	lb.	3.10	3.10	3.10	3.10
	sq. ft.	17.92	15.98	14.05	12.11
70—12½—2	lb.	3.09	3.09	3.09	3.09
	sq. ft.	17.86	15.93	14.00	12.07
70—10—5	lb.	3.08	3.08	3.08	3.08
	sq. ft.	17.81	15.88	13.96	12.03
72½—5—2	lb.	3.07	3.07	3.07	3.07
	sq. ft.	17.75	15.83	13.91	11.99
70—15	lb.	3.06	3.06	3.06	3.06
	sq. ft.	17.69	15.78	13.87	11.95

GALVANIZED SHEETS (cents)

14 12 52.5 3.281	15 12 47.5 2.969	16 12 42.5 2.656	17 13 38.5 2.406	18 13 34.5 2.156	19 13 30.5 1.906	20 13 26.5 1.656
3.33 10.93	3.33 9.89	3.33 8.85	3.61 8.69	3.61 7.78	3.61 6.88	3.61 5.98
3.29 10.80	3.29 9.77	3.29 8.74	3.57 8.59	3.57 7.70	3.57 6.81	3.57 5.91
3.28 10.76	3.28 9.74	3.28 8.71	3.55 8.54	3.55 7.65	3.55 6.77	3.55 5.88
3.25 10.66	3.25 9.65	3.25 8.63	3.52 8.47	3.52 7.59	3.52 6.71	3.52 5.83
3.24 10.63	3.24 9.62	3.24 8.61	3.51 8.45	3.51 7.57	3.51 6.69	3.51 5.81
3.23 10.60	3.23 9.59	3.23 8.58	3.50 8.42	3.50 7.55	3.50 6.67	3.50 5.80
3.21 10.53	3.21 9.53	3.21 8.53	3.48 8.37	3.48 7.50	3.48 6.63	3.48 5.76
3.19 10.47	3.19 9.47	3.19 8.47	3.46 8.33	3.46 7.46	3.46 6.60	3.46 5.73
3.18 10.43	3.18 9.44	3.18 8.45	3.45 8.30	3.45 7.44	3.45 6.58	3.45 5.71
3.18 10.43	3.18 9.44	3.18 8.45	3.44 8.28	3.44 7.42	3.44 6.56	3.44 5.70
3.16 10.37	3.16 9.38	3.16 8.39	3.43 8.25	3.43 7.40	3.43 6.54	3.43 5.68
3.16 10.37	3.16 9.38	3.16 8.39	3.42 8.23	3.42 7.37	3.42 6.52	3.42 5.66
3.14 10.30	3.14 9.32	3.14 8.34	3.40 8.18	3.40 7.33	3.40 6.48	3.40 5.63
3.14 10.30	3.14 9.32	3.14 8.34	3.40 8.18	3.40 7.33	3.40 6.48	3.40 5.63
3.11 10.20	3.11 9.23	3.11 8.26	3.37 8.11	3.37 7.27	3.37 6.42	3.37 5.58
3.10 10.17	3.10 9.20	3.10 8.23	3.35 8.06	3.35 7.22	3.35 6.39	3.35 5.55
3.09 10.14	3.09 9.17	3.09 8.21	3.34 8.04	3.34 7.20	3.34 6.37	3.34 5.53
3.08 10.11	3.08 9.14	3.08 8.18	3.33 8.01	3.33 7.18	3.33 6.35	3.33 5.52
3.07 10.07	3.07 9.11	3.07 8.15	3.33 8.01	3.33 7.18	3.33 6.35	3.33 5.52
3.06 10.04	3.06 9.08	3.06 8.13	3.32 7.99	3.32 7.16	3.32 6.33	3.32 5.50

Number of Gauge		21	22	23
List price per lb. (cts.)		13	14	14
Weight per sq. ft. (oz.)		24.5	22.5	20.5
Weight per sq. ft. (lbs.)		1.531	1.406	1.281
Discounts (per cent.)				
70—5—2½	lb.	3.61	3.89	3.89
	sq. ft.	5.53	5.47	4.98
65—20—2	lb.	3.67	3.84	3.84
	sq. ft.	5.47	5.40	4.92
65—20—2½	lb.	3.55	3.82	3.82
	sq. ft.	5.44	5.37	4.89
70—5—5	lb.	3.52	3.79	3.79
	sq. ft.	5.39	5.33	4.86
70—10	lb.	3.51	3.78	3.78
	sq. ft.	5.37	5.32	4.84
66⅔—15—5	lb.	3.50	3.77	3.77
	sq. ft.	5.36	5.30	4.83
65—15—10	lb.	3.48	3.75	3.75
	sq. ft.	5.33	5.27	4.80
65—20—5	lb.	3.46	3.72	3.72
	sq. ft.	5.30	5.23	4.77
70—5—5—2	lb.	3.45	3.71	3.71
	sq. ft.	5.28	5.22	4.75
70—10—2	lb.	3.44	3.70	3.70
	sq. ft.	5.27	5.20	4.74
70—7½—5	lb.	3.43	3.69	3.69
	sq. ft.	5.25	5.19	4.73
70—10—2½	lb.	3.42	3.69	3.69
	sq. ft.	5.24	5.19	4.73
70—10—3	lb.	3.40	3.67	3.67
	sq. ft.	5.21	5.16	4.70
72½—5	lb.	3.40	3.66	3.66
	sq. ft.	5.21	5.15	4.69
70—10—2—2	lb.	3.37	3.63	3.63
	sq. ft.	5.16	5.10	4.65
70—10—2½—2	lb.	3.35	3.61	3.61
	sq. ft.	5.13	5.08	4.63
70—12½—2	lb.	3.34	3.60	3.60
	sq. ft.	5.11	5.06	4.61
70—10—5	lb.	3.33	3.59	3.59
	sq. ft.	5.10	5.05	4.60
72½—5—2	lb.	3.33	3.58	3.58
	sq. ft.	5.10	5.03	4.59
70—15	lb.	3.32	3.57	3.57
	sq. ft.	5.08	5.02	4.57

GALVANIZED SHEETS (cents)

24 14	25 15	26 15	27 16	28 17	29 19	30 21
18.5 1.156	16.5 1.031	14.5 .9062	13.5 .8437	12.5 .7812	11.5 .7187	10.5 .6562
3.89 4.50	4.17 4.30	4.17 3.78	4.45 3.75	4.72 3.69	5.28 3.79	5.84 3.83
3.84 4.44	4.12 4.25	4.12 3.73	4.39 3.70	4.66 3.64	5.21 3.74	5.76 3.78
3.82 4.42	4.10 4.23	4.10 3.72	4.37 3.69	4.64 3.62	5.19 3.73	5.73 3.76
3.79 4.38	4.06 4.19	4.06 3.68	4.33 3.65	4.60 3.59	5.14 3.69	5.69 3.73
3.78 4.37	4.05 4.18	4.05 3.67	4.32 3.64	4.59 3.59	5.13 3.69	5.67 3.72
3.77 4.36	4.04 4.17	4.04 3.66	4.31 3.64	4.58 3.58	5.11 3.67	5.65 3.71
3.75 4.34	4.02 4.15	4.02 3.64	4.28 3.61	4.55 3.55	5.09 3.66	5.62 3.69
3.72 4.30	3.99 4.11	3.99 3.62	4.26 3.59	4.52 3.53	5.05 3.63	5.59 3.67
3.71 4.29	3.98 4.10	3.98 3.61	4.25 3.59	4.51 3.52	5.04 3.62	5.57 3.66
3.70 4.28	3.97 4.09	3.97 3.60	4.23 3.57	4.50 3.52	5.03 3.62	5.56 3.65
3.69 4.27	3.95 4.07	3.95 3.58	4.22 3.56	4.48 3.50	5.01 3.60	5.54 3.64
3.69 4.27	3.95 4.07	3.95 3.58	4.21 3.55	4.48 3.50	5.00 3.59	5.53 3.63
3.67 4.24	3.93 4.05	3.93 3.56	4.19 3.54	4.45 3.48	4.98 3.58	5.50 3.61
3.66 4.23	3.92 4.04	3.92 3.55	4.18 3.53	4.44 3.47	4.96 3.56	5.49 3.60
3.63 4.20	3.89 4.01	3.89 3.53	4.15 3.50	4.41 3.45	4.93 3.54	5.45 3.58
3.61 4.17	3.87 3.99	3.87 3.51	4.13 3.48	4.39 3.43	4.90 3.52	5.42 3.56
3.60 4.16	3.86 3.98	3.86 3.50	4.12 3.48	4.37 3.41	4.89 3.51	5.40 3.54
3.59 4.15	3.85 3.97	3.85 3.49	4.10 3.46	4.36 3.41	4.87 3.50	5.39 3.54
3.58 4.14	3.84 3.96	3.84 3.48	4.10 3.46	4.35 3.40	4.86 3.49	5.38 3.53
3.57 4.13	3.83 3.95	3.83 3.47	4.08 3.44	4.34 3.39	4.85 3.49	5.36 3.52

Number of Gauge		10	11	12	13
List price per lb. (cts.)...		12	12	12	12
Weight per sq. ft. (oz.)...		92.5	82.5	72.5	62.5
Weight per sq. ft. (lbs.)..		5.781	5.156	4.531	3.906
Discounts (per cent.)					
72½—5—2½	lb.	3.06	3.06	3.06	3.06
	sq. ft.	17.69	15.78	13.87	11.95
60—20—10—10—2	lb.	3.05	3.05	3.05	3.05
	sq. ft.	17.63	15.73	13.82	11.91
75	lb.	3.00	3.00	3.00	3.00
	sq. ft.	17.34	15.47	13.59	11.72
72½—10	lb.	2.97	2.97	2.97	2.97
	sq. ft.	17.17	15.31	13.46	11.60
75—2	lb.	2.94	2.94	2.94	2.94
	sq. ft.	17.00	15.16	13.32	11.48
75—2½	lb.	2.93	2.93	2.93	2.93
	sq. ft.	16.94	15.11	13.28	11.45
75—5	lb.	2.85	2.85	2.85	2.85
	sq. ft.	16.48	14.70	12.91	11.13
75—5—2	lb.	2.79	2.79	2.79	2.79
	sq. ft.	16.13	14.39	12.64	10.90
75—7½	lb.	2.78	2.78	2.78	2.78
	sq. ft.	16.07	14.33	12.60	10.86
75—7½—2	lb.	2.72	2.72	2.72	2.72
	sq. ft.	15.72	14.02	12.32	10.62
75—7½—2½	lb.	2.71	2.71	2.71	2.71
	sq. ft.	15.67	13.97	12.28	10.59
75—10	lb.	2.70	2.70	2.70	2.70
	sq. ft.	15.61	13.92	12.23	10.55
75—10—2	lb.	2.65	2.65	2.65	2.65
	sq. ft.	15.32	13.66	12.01	10.35
75—7½—5	lb.	2.64	2.64	2.64	2.64
	sq. ft.	15.26	13.61	11.96	10.31
75—7½—5—2	lb.	2.58	2.58	2.58	2.58
	sq. ft.	14.92	13.30	11.69	10.08
75—10—5	lb.	2.57	2.57	2.57	2.57
	sq. ft.	14.86	13.25	11.65	10.04
75—10—5—2	lb.	2.51	2.51	2.51	2.51
	sq. ft.	14.51	12.94	11.37	9.80
75—10—7½	lb.	2.50	2.50	2.50	2.50
	sq. ft.	14.45	12.89	11.33	9.77
75—10—7½—2 ..	lb.	2.45	2.45	2.45	2.45
	sq. ft.	14.16	12.63	11.10	9.57
75—10—7½—2½ .	lb.	2.44	2.41	2.44	2.44
	sq. ft.	14.11	12.58	11.06	9.53

GALVANIZED SHEETS (cents)

14 12 52.5 3.281	15 12 47.5 2.969	16 12 42.5 2.656	17 13 38.5 2.406	18 13 34.5 2.156	19 13 30.5 1.906	20 13 26.5 1.656
3.06 10.04	3.06 9.08	3.06 8.13	3.31 7.96	3.31 7.14	3.31 6.31	3.31 5.48
3.05 10.01	3.05 9.05	3.05 8.10	3.30 7.94	3.30 7.12	3.30 6.29	3.30 5.47
3.00 9.84	3.00 8.91	3.00 7.97	3.25 7.82	3.25 7.01	3.25 6.20	3.25 5.38
2.97 9.75	2.97 8.82	2.97 7.89	3.22 7.75	3.22 6.94	3.22 6.14	3.22 5.33
2.94 9.65	2.94 8.73	2.94 7.81	3.19 7.68	3.19 6.88	3.19 6.08	3.19 5.28
2.93 9.61	2.93 8.70	2.93 7.78	3.17 7.63	3.17 6.84	3.17 6.04	3.17 5.25
2.85 9.35	2.85 8.46	2.85 7.57	3.09 7.44	3.09 6.66	3.09 5.89	3.09 5.12
2.79 9.15	2.79 8.28	2.79 7.41	3.03 7.29	3.03 6.53	3.03 5.78	3.03 5.02
2.78 9.12	2.78 8.25	2.78 7.38	3.01 7.24	3.01 6.49	3.01 5.74	3.01 4.99
2.72 8.92	2.72 8.07	2.72 7.22	2.95 7.10	2.95 6.36	2.95 5.62	2.95 4.89
2.71 8.89	2.71 8.05	2.71 7.20	2.93 7.05	2.93 6.32	2.93 5.59	2.93 4.85
2.70 8.86	2.70 8.02	2.70 7.17	2.93 7.05	2.93 6.32	2.93 5.59	2.93 4.85
2.65 8.70	2.65 7.87	2.65 7.04	2.87 6.91	2.87 6.19	2.87 5.47	2.87 4.75
2.64 8.66	2.64 7.84	2.64 7.01	2.86 6.88	2.86 6.17	2.86 5.45	2.86 4.74
2.58 8.47	2.58 7.66	2.58 6.85	2.80 6.74	2.80 6.04	2.80 5.34	2.80 4.64
2.57 8.43	2.57 7.63	2.57 6.83	2.78 6.69	2.78 5.99	2.78 5.30	2.78 4.60
2.51 8.24	2.51 7.45	2.51 6.67	2.72 6.54	2.72 5.86	2.72 5.18	2.72 4.50
2.50 8.20	2.50 7.42	2.50 6.64	2.71 6.52	2.71 5.84	2.71 5.17	2.71 4.49
2.45 8.04	2.45 7.27	2.45 6.51	2.65 6.38	2.65 5.71	2.65 5.05	2.65 4.39
2.44 8.01	2.44 7.24	2.44 6.48	2.64 6.35	2.64 5.69	2.64 5.03	2.64 4.37

		21	22	23
Number of Gauge				
List price per lb. (cts.)		13	14	14
Weight per sq. ft. (oz.)		24.5	22.5	20.5
Weight per sq. ft. (lbs.)		1.531	1.406	1.281
Discounts (per cent.)				
72½—5—2½	lb.	3.31	3.57	3.57
	sq. ft.	5.07	5.02	4.57
60—20—10—10—2	lb.	3.30	3.56	3.56
	sq. ft.	5.05	5.01	4.56
75	lb.	3.25	3.50	3.50
	sq. ft.	4.98	4.92	4.48
72½—10	lb.	3.22	3.47	3.47
	sq. ft.	4.93	4.88	4.45
75—2	lb.	3.19	3.43	3.43
	sq. ft.	4.88	4.82	4.39
75—2½	lb.	3.17	3.41	3.41
	sq. ft.	4.85	4.80	4.37
75—5	lb.	3.09	3.33	3.33
	sq. ft.	4.73	4.68	4.27
75—5—2	lb.	3.03	3.26	3.26
	sq. ft.	4.64	4.58	4.18
75—7½	lb.	3.01	3.24	3.24
	sq. ft.	4.61	4.56	4.15
75—7½—2	lb.	2.95	3.17	3.17
	sq. ft.	4.52	4.46	4.06
75—7½—2½	lb.	2.93	3.16	3.16
	sq. ft.	4.49	4.44	4.05
75—10	lb.	2.93	3.15	3.15
	sq. ft.	4.49	4.43	4.04
75—10—2	lb.	2.87	3.09	3.09
	sq. ft.	4.39	4.35	3.96
75—7½—5	lb.	2.86	3.08	3.08
	sq. ft.	4.38	4.33	3.95
75—7½—5—2	lb.	2.80	3.01	3.01
	sq. ft.	4.29	4.23	3.86
75—10—5	lb.	2.78	2.99	2.99
	sq. ft.	4.26	4.20	3.83
75—10—5—2	lb.	2.72	2.93	2.93
	sq. ft.	4.16	4.12	3.75
75—10—7½	lb.	2.71	2.91	2.91
	sq. ft.	4.15	4.09	3.73
75—10—7½—2	lb.	2.65	2.86	2.86
	sq. ft.	4.06	4.02	3.66
75—10—7½—2½	lb.	2.64	2.84	2.84
	sq. ft.	4.04	3.99	3.64

GALVANIZED SHEETS (cents)

24 14 18.5 1.156	25 15 16.5 1.031	26 15 14.5 .9062	27 16 13.5 .8437	28 17 12.5 .7812	29 19 11.5 .7187	30 21 10.5 .6562
3.57 4.13	3.82 3.94	3.82 3.46	4.08 3.44	4.33 3.38	4.84 3.48	5.35 3.51
3.56 4.12	3.81 3.93	3.81 3.45	4.06 3.43	4.32 3.37	4.83 3.47	5.33 3.50
3.50 4.05	3.75 3.87	3.75 3.40	4.00 3.37	4.25 3.32	4.75 3.41	5.25 3.45
3.47 4.01	3.71 3.83	3.71 3.36	3.96 3.34	4.21 3.29	4.70 3.38	5.20 3.41
3.43 3.97	3.68 3.79	3.68 3.33	3.92 3.31	4.17 3.26	4.66 3.35	5.15 3.38
3.41 3.94	3.66 3.77	3.66 3.32	3.90 3.29	4.14 3.23	4.63 3.33	5.12 3.36
3.33 3.85	3.56 3.67	3.56 3.23	3.80 3.21	4.04 3.16	4.51 3.24	4.99 3.27
3.26 3.77	3.49 3.60	3.49 3.16	3.72 3.14	3.96 3.09	4.42 3.18	4.89 3.21
3.24 3.75	3.47 3.58	3.47 3.14	3.70 3.12	3.93 3.07	4.39 3.16	4.86 3.19
3.17 3.67	3.40 3.51	3.40 3.08	3.63 3.06	3.85 3.01	4.31 3.10	4.76 3.12
3.16 3.65	3.38 3.49	3.38 3.06	3.61 3.05	3.83 2.99	4.28 3.08	4.73 3.10
3.15 3.64	3.38 3.49	3.38 3.06	3.60 3.04	3.83 2.99	4.28 3.08	4.73 3.10
3.09 3.57	3.31 3.41	3.31 3.00	3.53 2.98	3.75 2.93	4.19 3.01	4.63 3.04
3.08 3.56	3.30 3.40	3.30 2.99	3.52 2.97	3.73 2.91	4.17 3.00	4.61 3.03
3.01 3.48	3.23 3.33	3.23 2.93	3.44 2.90	3.66 2.86	4.09 2.94	4.52 2.97
2.99 3.46	3.21 3.31	3.21 2.91	3.42 2.89	3.63 2.84	4.06 2.92	4.49 2.95
2.93 3.39	3.14 3.24	3.14 2.85	3.35 2.83	3.56 2.78	3.98 2.86	4.40 2.89
2.91 3.36	3.12 3.22	3.12 2.83	3.33 2.81	3.54 2.77	3.95 2.84	4.37 2.87
2.86 3.31	3.06 3.16	3.06 2.77	3.26 2.75	3.47 2.71	3.88 2.79	4.28 2.81
2.84 3.28	3.04 3.13	3.04 2.75	3.25 2.74	3.45 2.70	3.86 2.77	4.26 2.80

Number of Gauge		10	11	12	13
List price per lb. (cts.)...		12	12	12	12
Weight per sq. ft. (oz.)...		92.5	82.5	72.5	62.5
Weight per sq. ft. (lbs.)..		5.781	5.156	4.531	3.906
Discounts (per cent.)					
75—10—10	lb.	2.43	2.43	2.43	2.43
	sq. ft.	14.05	12.53	11.01	9.49
80	lb.	2.40	2.40	2.40	2.40
	sq. ft.	13.87	12.37	10.87	9.37
75—10—10—2 ...	lb.	2.38	2.38	2.38	2.38
	sq. ft.	13.76	12.27	10.78	9.30
75—10—10—2½ ..	lb.	2.37	2.37	2.37	2.37
	sq. ft.	13.70	12.22	10.74	9.26
80—2	lb.	2.35	2.35	2.35	2.35
	sq. ft.	13.59	12.12	10.65	9.18
80—2½	lb.	2.34	2.34	2.34	2.34
	sq. ft.	13.53	12.07	10.60	9.14
80—2—2	lb.	2.31	2.31	2.31	2.31
	sq. ft.	13.35	11.91	10.46	9.02
80—2½—2	lb.	2.29	2.29	2.29	2.29
	sq. ft.	13.24	11.81	10.38	8.95
80—3—2	lb.	2.28	2.28	2.28	2.28
	sq. ft.	13.18	11.76	10.33	8.91
80—5	lb.	2.28	2.28	2.28	2.28
	sq. ft.	13.18	11.76	10.33	8.91
80—2—2—2	lb.	2.26	2.26	2.26	2.26
	sq. ft.	13.07	11.65	10.24	8.83
80—4—2	lb.	2.26	2.26	2.26	2.26
	sq. ft.	13.07	11.65	10.24	8.83
80—2½—2—2 ...	lb.	2.25	2.25	2.25	2.25
	sq. ft.	13.01	11.60	10.20	8.79
80—5—2	lb.	2.23	2.23	2.23	2.23
	sq. ft.	12.89	11.50	10.10	8.71
80—5—2½	lb.	2.22	2.22	2.22	2.22
	sq. ft.	12.83	11.45	10.06	8.67
80—7½	lb.	2.22	2.22	2.22	2.22
	sq. ft.	12.83	11.45	10.06	8.67
80—5—2—2	lb.	2.19	2.19	2.19	2.19
	sq. ft.	12.66	11.29	9.92	8.55
80—5—2½—2	lb.	2.18	2.18	2.18	2.18
	sq. ft.	12.60	11.24	9.88	8.52
80—7½—2	lb.	2.18	2.18	2.18	2.18
	sq. ft.	12.60	11.24	9.88	8.52
80—7½—2½	lb.	2.16	2.16	2.16	2.16
	sq. ft.	12.49	11.14	9.79	8.44

GALVANIZED SHEETS (cents)

14 12 52.5 3.281	15 12 47.5 2.969	16 12 42.5 2.656	17 13 38.5 2.406	18 13 34.5 2.156	19 13 30.5 1.906	20 13 26.5 1.656
2.43 7.97	2.43 7.21	2.43 6.45	2.63 6.33	2.63 5.67	2.63 5.01	2.63 4.36
2.40 7.87	2.40 7.12	2.40 6.37	2.60 6.26	2.60 5.61	2.60 4.96	2.60 4.31
2.38 7.81	2.38 7.07	2.38 6.32	2.58 6.21	2.58 5.56	2.58 4.92	2.58 4.27
2.37 7.78	2.37 7.04	2.37 6.30	2.57 6.18	2.57 5.54	2.57 4.90	2.57 4.26
2.35 7.71	2.35 6.98	2.35 6.24	2.55 6.14	2.55 5.50	2.55 4.86	2.55 4.22
2.34 7.68	2.34 6.95	2.34 6.22	2.54 6.11	2.54 5.48	2.54 4.84	2.54 4.21
2.31 7.58	2.31 6.86	2.31 6.14	2.50 6.02	2.50 5.39	2.50 4.77	2.50 4.14
2.29 7.51	2.29 6.80	2.29 6.08	2.48 5.97	2.48 5.35	2.48 4.73	2.48 4.11
2.28 7.48	2.28 6.77	2.28 6.06	2.47 5.94	2.47 5.33	2.47 4.71	2.47 4.09
2.28 7.48	2.28 6.77	2.28 6.06	2.47 5.94	2.47 5.33	2.47 4.71	2.47 4.09
2.26 7.42	2.26 6.71	2.26 6.00	2.45 5.90	2.45 5.28	2.45 4.67	2.45 4.06
2.26 7.42	2.26 6.71	2.26 6.00	2.45 5.90	2.45 5.28	2.45 4.67	2.45 4.06
2.25 7.38	2.25 6.68	2.25 5.98	2.43 5.85	2.43 5.24	2.43 4.63	2.43 4.02
2.23 7.32	2.23 6.62	2.23 5.92	2.42 5.82	2.42 5.22	2.42 4.61	2.42 4.01
2.22 7.28	2.22 6.59	2.22 5.90	2.41 5.80	2.41 5.20	2.41 4.59	2.41 3.99
2.22 7.28	2.22 6.59	2.22 5.90	2.41 5.80	2.41 5.20	2.41 4.59	2.41 3.99
2.19 7.19	2.19 6.50	2.19 5.82	2.37 5.70	2.37 5.11	2.37 4.52	2.37 3.93
2.18 7.15	2.18 6.47	2.18 5.79	2.36 5.68	2.36 5.09	2.36 4.50	2.36 3.91
2.18 7.15	2.18 6.47	2.18 5.79	2.36 5.68	2.36 5.09	2.36 4.50	2.36 3.91
2.16 7.09	2.16 6.41	2.16 5.74	2.34 5.63	2.34 5.05	2.34 4.46	2.34 3.88

Number of Gauge		21	22	23
List price per lb. (cts.)		13	14	14
Weight per sq. ft. (oz.)		24.5	22.5	20.5
Weight per sq. ft. (lbs.)		1.531	1.406	1.281
Discounts (per cent.)				
75—10—10	lb.	2.63	2.84	2.84
	sq. ft.	4.03	3.99	3.64
80	lb.	2.60	2.80	2.80
	sq. ft.	3.98	3.94	3.59
75—10—10—2	lb.	2.58	2.78	2.78
	sq. ft.	3.95	3.91	3.56
75—10—10—2½	lb.	2.57	2.76	2.76
	sq. ft.	3.94	3.88	3.54
80—2	lb.	2.55	2.74	2.74
	sq. ft.	3.90	3.85	3.51
80—2½	lb.	2.54	2.73	2.73
	sq. ft.	3.89	3.84	3.50
80—2—2	lb.	2.50	2.69	2.69
	sq. ft.	3.83	3.78	3.45
80—2½—2	lb.	2.48	2.68	2.68
	sq. ft.	3.80	3.77	3.43
80—3—2	lb.	2.47	2.66	2.66
	sq. ft.	3.78	3.74	3.41
80—5	lb.	2.47	2.66	2.66
	sq. ft.	3.78	3.74	3.41
80—2—2—2	lb.	2.45	2.64	2.64
	sq. ft.	3.75	3.71	3.38
80—4—2	lb.	2.45	2.63	2.63
	sq. ft.	3.75	3.70	3.37
80—2½—2—2	lb.	2.43	2.62	2.62
	sq. ft.	3.72	3.68	3.36
80—5—2	lb.	2.42	2.61	2.61
	sq. ft.	3.71	3.67	3.34
80—5—2½	lb.	2.41	2.59	2.59
	sq. ft.	3.69	3.64	3.32
80—7½	lb.	2.41	2.59	2.59
	sq. ft.	3.69	3.64	3.32
80—5—2—2	lb.	2.37	2.55	2.55
	sq. ft.	3.63	3.59	3.27
80—5—2½—2	lb.	2.36	2.54	2.54
	sq. ft.	3.61	3.57	3.25
80—7½—2	lb.	2.36	2.54	2.54
	sq. ft.	3.61	3.57	3.25
80—7½—2½	lb.	2.34	2.53	2.53
	sq. ft.	3.58	3.56	3.24

GALVANIZED SHEETS (cents)

24 14 18.5 1.156	25 15 16.5 1.031	26 15 14.5 .9062	27 16 13.5 .8437	28 17 12.5 .7812	29 19 11.5 .7187	30 21 10.5 .6562
2.84 3.28	3.04 3.13	3.04 2.75	3.24 2.73	3.44 2.69	3.85 2.77	4.25 2.79
2.80 3.24	3.00 3.09	3.00 2.72	3.20 2.70	3.40 2.66	3.80 2.73	4.20 2.76
2.78 3.21	2.98 3.07	2.98 2.70	3.18 2.68	3.37 2.63	3.77 2.71	4.17 2.74
2.76 3.19	2.96 3.05	2.96 2.68	3.16 2.67	3.36 2.62	3.75 2.70	4.15 2.72
2.74 3.17	2.94 3.03	2.94 2.66	3.14 2.65	3.33 2.60	3.72 2.67	4.12 2.70
2.73 3.16	2.93 3.02	2.93 2.66	3.12 2.63	3.32 2.59	3.71 2.67	4.10 2.69
2.69 3.11	2.88 2.97	2.88 2.61	3.07 2.59	3.27 2.55	3.65 2.62	4.03 2.64
2.68 3.10	2.87 2.96	2.87 2.60	3.06 2.58	3.25 2.54	3.63 2.61	4.01 2.63
2.66 3.08	2.85 2.94	2.85 2.58	3.04 2.56	3.23 2.52	3.61 2.59	3.99 2.62
2.66 3.08	2.85 2.94	2.85 2.58	3.04 2.56	3.23 2.52	3.61 2.59	3.99 2.62
2.64 3.05	2.82 2.91	2.82 2.56	3.01 2.54	3.20 2.50	3.58 2.57	3.95 2.59
2.63 3.04	2.82 2.91	2.82 2.56	3.01 2.54	3.20 2.50	3.58 2.57	3.95 2.59
2.62 3.03	2.81 2.90	2.81 2.55	3.00 2.53	3.18 2.48	3.56 2.56	3.93 2.58
2.61 3.02	2.79 2.88	2.79 2.53	2.98 2.51	3.17 2.48	3.54 2.54	3.91 2.57
2.59 2.99	2.78 2.87	2.78 2.52	2.96 2.50	3.15 2.46	3.52 2.53	3.89 2.55
2.59 2.99	2.78 2.87	2.78 2.52	2.96 2.50	3.15 2.46	3.52 2.53	3.89 2.55
2.55 2.95	2.74 2.83	2.74 2.48	2.92 2.46	3.10 2.42	3.47 2.49	3.83 2.51
2.54 2.94	2.72 2.80	2.72 2.46	2.90 2.45	3.09 2.41	3.45 2.48	3.81 2.50
2.54 2.94	2.72 2.80	2.72 2.46	2.90 2.45	3.08 2.41	3.44 2.47	3.81 2.50
2.53 2.93	2.71 2.79	2.71 2.46	2.89 2.44	3.07 2.40	3.43 2.47	3.79 2.49

TABLE OF TINNED AND TERNE PLATES.

Size. Inches.	Mark.	No. of Sheets in Box.	Weight Per Box Pounds.	Size Inches.	Mark.	No. of Sheets in Box.	Weight Per Box Pounds.
9 x18	IC	225	130	14 x 20	IXX	112	161
"	IX	"	162	"	IXXX	"	182
10 x10	IC	"	80	"	IXXXX	"	203
"	IX	"	100	14 x 22	IX	"	154
10 x14	IC	"	112	"	IXX	"	177
"	IX	"	140	14 x 24	IX	"	168
"	IXX	"	161	"	IXX	"	193
"	IXXX	"	182	14 x 25	IC	"	140
"	IXXXX	"	203	"	IX	"	175
10 x20	IC	"	160	"	IXX	"	201
"	IX	"	200	14 x 26	IXXX	"	237
11 x11	IC	"	97	14 x 28	IC	"	157
"	IX	"	121	"	IX	"	196
11 x22	IC	112	97	"	IXX	"	225
"	IX	"	121	14 x 30	IXX	"	241
"	IXX	"	139	14 x 31	IX	"	217
12 x12	IC	225	112	14 x 31	IXX	"	249
"	IX	"	140	15 x 15	IX	225	225
"	IXX	"	161	"	IXX	"	259
12 x24	IC	112	115	"	IXXX	"	326
"	IX	"	144	16 x 16	IC	225	205
"	IXX	"	166	"	IX	"	256
"	IXXX	"	187	"	IXX	"	294
12½x17	DC	100	98	16 x 19	IX	112	152
"	DX	"	120	17 x 17	IX	"	141
"	DXX	"	147	"	IXX	"	166
"	DXXX	"	168	17 x 25	DX	100	252
"	DXXXX	"	189	"	DXX	"	294
13 x13	IC	225	135	18 x 18	IX	112	162
"	IX	"	169	"	IXX	"	180
"	IXX	"	194	"	IXXXX	"	235
13 x26	IC	112	135	20 x 20	IX	"	200
"	IX	"	169	20 x 20	IXX	"	230
"	IXX	"	194	"	IXXX	"	260
14 x14	IC	225	156	"	IXXXX	"	290
"	IX	"	196	20 x 28	IC	"	224
"	IXX	225	225	"	IX	"	280
"	IXXX	"	254	"	IXX	"	322
14 x20	IC	112	112	"	IXXX	"	364
"	IX	"	140	"	IXXXX	"	406

TABLE OF TINNED AND TERNE PLATE.—(Continued.)

The *marks* indicate the *thickness*, approximately, as follows :

Mark.	No. Birmingham wire ga'ge	Ins.	Lbs. per square ft.	Mark.	No. Birmingham wire ga'ge	Ins.	Lbs. per square ft.
1C	30	.012	.48	DC	27	.016	.64
1X	28	.014	.56	DX	25	.020	.80
1XX	27	.016	.64	DXX	23	.025	1.00
1XXX	26	.018	.72	DXXX	22	.028	1.13
1XXXX	25	.020	.80	DXXXX	21	.032	1.29

TERNE PLATES.

Size. Inches.	Mark.	Number of sheets in box.	Weight per box. Lbs.
10 x 20	1C	112	80
"	1X	"	100
14 x 20	1C	"	112
"	1X	"	140
20 x 28	1C	"	224
"	1X	"	280

A box of 225 sheets of 13¾ x 10 contains 214.84 square feet, but, allowing for overlapping, it will cover but about 150 square feet of roof; even without any allowance for the waste which occurs in cutting away portions in order to fit at angles, etc.

To find the area of roof covered by any sheet, first deduct two inches from its width and one inch from its length.

A roof covered with tin or other metal, should slope not less than one inch to a foot.

Leaded tin is much used for roofing. It is simply sheet iron coated with lead instead of tin, and is not as durable as the tinned sheets.

Where coal is used for fuel, tin roofs should receive a good coat of paint when first put on, and a coat every year after.

Spanish brown is an excellent paint for this purpose.

TABLE SHOWING WEIGHT IN POUNDS OF SHEET AND BAR BRASS.

Randolph & Clowes, Waterbury, Conn.

Thickness or Diameter in Inches.	Sheets Per Square Foot.	Square Bars One Foot Long.	Round Bars One Foot Long.
1-16	2.7	.015	.011
1-8	5.41	.055	.045
3-16	8.12	.125	.1
1-4	10.76	.255	.175
5-16	13.48	.350	.275
3-8	16.25	.51	.395
7-16	19.	.69	.54
1-2	21.65	.905	.71
9-16	24.3	1.15	.9
5-8	27.12	1.4	1.1
11-16	29.77	1.72	1.35
3-4	32.46	2.05	1.59
13-16	35.18	2.4	1.85
7-8	37.85	2.75	2.15
15-16	40.55	3.15	2.48
1	43.29	3.65	2.85
1-16	45.95	4.08	3.20
1-8	48.69	4.55	3.57
3-16	51.4	5.08	3.97
1-4	54.18	5.65	4.41
5-16	56.85	6.22	4.86
3-8	59.55	6.81	5.35
7-16	62.25	7.45	5.85
1-2	65.	8.13	6.37
9-16	67.75	8.83	6.92
5-8	70.35	9.55	7.48
11-16	73.	10.27	8.05
3-4	75.86	11.	8.65
13-16	78.55	11.82	9.29
7-8	81.25	12.68	9.95
15-16	84.	13.05	10.58
2	86.75	14.35	11.25

WEIGHT OF SHEET BRASS.

Randolph & Clowes, Waterbury, Conn.—Brown & Sharpe's Gauge.

Gauge, No. of	Size of Each No.	Weight per Square Foot.	No. of Gauge.	Size of Each No.	Weight per Square Foot.
0000	.46000	19.688	19	.035890	1.5361
000	.40964	17.533	20	.031961	1.3679
00	.36480	15.613	21	.028462	1.2182
0	.32486	13.904	22	.025347	1.0849
1	.28930	12.382	23	.022571	.96604
2	.25763	11.027	24	.020100	.86028
3	.22942	9.8192	25	.017900	.76612
4	.20431	8.7445	26	.01594	.68223
5	.18194	7.787	27	.014195	.60755
6	.16202	6.9345	28	.012641	.54103
7	.14428	6.1752	29	.011257	.48180
8	.12849	5.4994	30	.010025	.42907
9	.11443	4.8976	31	.008928	.38212
10	.10189	4.3609	32	.007950	.34026
11	.090742	3.8838	33	.007080	.30302
12	.080808	3.4586	34	.006304	.26981
13	.071961	3.0799	35	.005614	.24028
14	.064084	2.7428	36	.005000	.2140
15	.057068	2.4425	37	.004453	.19059
16	.050820	2.1751	38	.003965	.1697
17	.045257	1.937	39	.003531	.15113
18	.040303	1.725	40	.003144	.13456

SHEET ZINC.

ZINC GAUGE.

No.	Weight per Square Foot.	Thickness in Decimals.	No.	Weight per Square Foot.	Thickness in Decimals.
5	0.37	.010	16	1.68	.045
6	0.45	.012	17	1.87	.050
7	0.52	.014	18	2.06	.055
8	0.60	.016	19	2.25	.060
9	0.67	.018	20	2.62	.070
10	0.75	.020	21	3.00	.080
11	0.90	.024	22	3.37	.090
12	1.05	.028	23	3.75	.100
13	1.20	.032	24	4.70	.125
14	1.35	.036	25	9.40	.250
15	1.50	.040	26	14.00	.375

TABLE SHOWING THE DIFFERENCE BETWEEN WIRE GAUGES.

No.	Brown & Sharpe's.	Old English, or London.	Stubs', or Birmingham.
0000	.460	.454	.454
000	.40964	.425	.425
00	.36480	.380	.380
0	.32495	.340	.340
1	.28930	.300	.300
2	.25763	.284	.284
3	.22942	.259	.259
4	.20431	.238	.238
5	.18194	.220	.220
6	.16202	.203	.203
7	.14428	.180	.180
8	.12849	.165	.165
9	.11443	.148	.148
10	.10189	.134	.134
11	.09074	.120	.120
12	.08081	.109	.109
13	.07196	.095	.095
14	.06408	.083	.083
15	.05706	.072	.072
16	.05082	.065	.065
17	.04525	.058	.058
18	.04030	.049	.049
19	.03589	.040	.042
20	.03196	.035	.035
21	.02846	.0315	.032
22	.025347	.0295	.028
23	.022571	.027	.025
24	.0201	.025	.022
25	.0179	.023	.020
26	.01594	.0205	.018
27	.014195	.01875	.016
28	.012641	.0165	.014
29	.011257	.0155	.013
30	.010025	.01375	.012
31	.008928	.01225	.010
32	.00795	.01125	.009
33	.00708	.01025	.008
34	.0063	.0095	.007
35	.00561	.009	.005
36	.005	.0075	.004
37	.00445	.0065	....
38	.003965	.00575	....
39	.003531	.005	....
40	.003144	.0045	....

COIL AND CRANE CHAIN.

Size—Inches.	Weight Per Foot.	Ordinary Guaranteed Proof Test. Pounds.	Coil and Crane Guaranteed Tensile Test. Pounds.	B. B. B. Guaranteed Proof Test. Pounds.	Crane. Guaranteed Tensile Test. Pounds.
3/16	7.5 oz.	1,000	2,000	1,200	2,500
1/4	12 "	1,500	3,000	1,800	3,500
5/16	1 lb.	3,000	5,000	3,500	6,000
3/8	1.5 lbs.	3,800	7,500	4,800	9,000
7/16	2 "	5,650	9,000	6,540	12,000
1/2	2.5 "	8,000	11,500	9,000	15,000
9/16	3.25 "	10,000	16,000	11,000	20,000
5/8	4.1 "	12,000	19,000	14,000	24,000
3/4	5.5 "	16,000	29,000	18,000	34,000
7/8	7.5 "	20,000	40,000	24,000	45,000
1	10 "	30,120	50,000	34,100	58,500
1 1/8	12.5 "	36,150	66,000	44,130	74,000
1 1/4	15 "	47,000	80,000	52,160	90,000
1 3/8	17.5 "	58,000	90,000	62,200	100,000
1 7/16	19 "	65,000	100,000	72,300	115,000
1 1/2	22 "	72,000	116,000	80,000	132,000

(Jas. McKay & Co.)

BOILER RIVETS.—Cone or Oval Head.

NUMBER OF BURDEN'S BOILER RIVETS IN 100 POUNDS.

Length.	1-2 Diam.	9-16 Diam.	5-8 Diam.	11-16 Di'm	3-4 Diam.	7-8 Diam.
¾	1,092	.....	665	.....	.....	.....
⅞	1,027	.....	597	.....	.....	.....
1	940	760	538	450	.....	.....
1⅛	840	725	512	415	.....	.....
1¼	797	690	487	389	356	228
1⅜	780	650	460	370	329	211
1½	730	625	440	357	280	180
1⅝	711	595	420	340	271	174
1¾	693	550	390	325	262	169
1⅞	648	530	375	312	257	165
2	608	510	360	297	243	156
2⅛	573	500	354	289	237	152
2¼	555	490	347	280	232	149
2⅜	525	475	335	260	220	141
2½	500	440	312	242	208	133
3	460	410	290	224	197	127
3¼	433	380	267	212	180	115
3½	412	350	248	201	169	108
3¾	395	335	241	192	160	102
4	.....	326	230	184	158	99
4¼	.....	312	220	177	150	96
4½	.....	298	210	171	146	94
4¾	.....	284	200	166	138	89
5	.....	270	190	161	135	87
5¼	.....	257	180	156	130	84
5½	.....	247	172	151	124	80
5¾	.....	233	164	145	120	77
6	.....	223	157	140	115	74
6¼	.....	215	150	138	111	71
6½	.....	207	146	134	107	69
6¾	.....	202	143	129	104	66
7	.....	198	140	125	100	64
7¼	.....	.....	.....	.....	.....	.....
7½	.....	.....	.....	.....	.....	.....
8	.....	.....	.....	.....	.....	.....

The length of rivets is the measure under the heads.

TANK RIVETS.

NUMBER TO THE POUND.

Length.	3/16 Diam.		1/4 In. Diam.		5/16 In. Diam.		3/8 In. Diam.	
	F. & R. H.	Cou. Sun.	F. & R. H.	Cou. Sun.	F. & R. H.	Cou. Sun.	F. & R. H.	Cou. Sun.
3/8	165	.....	103	.....	.....	.....	.....	.....
7/16		205	93	.....	.....	.....	.....	.....
1/2	140	172	80	108	50	69	31	46
5/8	125	147	75	94	43	60	28	40
3/4	103	130	64	75	39	51	23	36
7/8	91	109	56	68	35	47	21	31
1	84	101	49	63	32	42	19	28
1 1/8	77	93	45	56	31	36	18	24
1 1/4	73	85	42	49	27	34	17	22
1 3/8	69	.....	40	47	25	31	16	21
1 1/2	63	.....	37	42	24	29	15	20
1 5/8	58	.....	35	41	22	27	14	19
1 3/4	54	.....	32	39	21	25	13	18
1 7/8	50	.....	30	35	20	23	12	17
2	48	.....	29	33	19	22	11	16

LENGTH AND NUMBER OF TACKS TO THE POUND.

Title.	Length.	No. per Lb.	Title.	Length.	No. per Lb.
1 oz.	1/8 in.	16,000	10 oz.	11/16	1,600
1 1/2 "	3/16 "	10,666	12 "	3/4	1,333
2 "	1/4 "	8,000	14 "	13/16	1,143
2 1/2 "	5/16 "	6,400	16 "	7/8	1,000
3 "	3/8 "	5,333	18 "	15/16	888
4 "	7/16 "	4,000	20 "	1	800
6 "	9/16 "	2,666	22 "	1 1/16	727
8 "	5/8 "	2,000	24 "	1 1/8	666

WEIGHT OF HINGES PER DOZEN PAIRS—POUNDS.

Size in Inches.	3	4	5	6	8	10	12	14	16
Extra H. T.	.....	.....	14	21	33	55	78	90	103
Heavy T	.....	4½	7	8¼	12	18⅜	30⅝	41¾	.....
Light T.	2¾	3⅝	4 15/16	6	9½	13	21½	31½	.....
Heavy Strap	.....	6½	10	18½	31½	51½	76	85	103
Light Strap.	3	3¾	6¼	8¾	15	21	35¼	46	55

WIRE.

Weight of 100 Lineal Feet.

B. W. G.

B. W. Gauge.	Iron.	Steel.	Brass.	Copper.
	Lbs.	Lbs.	Lbs.	Lbs.
0	30.58	30.92	33.43	35.17
1	25.75	26.04	28.15	29.62
2	21.84	21.57	23.32	24.54
3	18.02	18.22	19.70	20.72
4	15.11	15.28	16.52	17.38
5	12.46	12.59	13.62	14.33
6	11.45	11.57	12.51	13.16
7	9.25	9.35	10.11	10.64
8	7.29	7.37	7.97	8.38
9	6.60	6.68	7.22	7.59
10	4.96	5.02	5.43	5.71
11	4.13	4.18	4.52	4.75
12	3.14	3.18	3.43	3.61
13	2.34	2.36	2.55	2.69
14	1.69	1.71	1.85	1.95
15	1.37	1.39	1.50	1.58
16	1.05	1.06	1.15	1.21
17	.804	.815	.877	.928
18	.612	.622	.674	.704
19	.471	.478	.510	.547
20	.326	.331	.342	.372
21	.271	.274	.293	.310
22	.208	.210	.224	.237
23	.166	.167	.179	.189
24	.128	.129	.138	.147
25	.106	.107	.114	.121
26	.086	.087	.093	.098
27	.068	.069	.073	.078
28	.052	.053	.056	.059
29	.045	.046	.048	.051
30	.038	.039	.041	.044

WROUGHT IRON PIPE—Standard Dimensions.

Inside diameter. Nominal.	Inside diameter. Actual.	Thickness.	Internal circumference.	External circumference.	Length of pipe per sq. ft. of inside surface.
Inches.	Inches.	Inches.	Inches.	Inches.	Feet.
$\frac{1}{8}$	0.270	0.068	0.848	1.272	14.15
$\frac{1}{4}$	0.364	0.088	1.144	1.696	10.50
$\frac{3}{8}$	0.494	0.091	1.552	2.121	7.67
$\frac{1}{2}$	0.623	0.109	1.957	2.652	6.13
$\frac{3}{4}$	0.824	0.113	2.589	3.299	4.635
1	1.048	0.134	3.292	4.134	3.679
$1\frac{1}{4}$	1.380	0.140	4.335	5.215	2.768
$1\frac{1}{2}$	1.611	0.145	5.061	5.969	2.371
2	2.067	0.154	6.494	7.461	1.848
$2\frac{1}{2}$	2.468	0.204	7.754	9.032	1.547
3	3.067	0.217	9.636	10.996	1.245
$3\frac{1}{2}$	3.548	0.226	11.146	12.566	1.077
4	4.026	0.237	12.648	14.137	0.949
$4\frac{1}{2}$	4.508	0.247	14.153	15.708	0.848
5	5.045	0.259	15.849	17.475	0.757
6	6.065	0.280	19.054	20.813	0.63
7	7.023	0.301	22.063	23.954	0.544
8	7.982	0.322	25.076	27.096	0.478
9	9.001	0.344	28.277	30.433	0.425
10	10.019	0.366	31.475	33.772	0.381

WROUGHT IRON PIPE—Standard Dimensions—(Continued.)

Length of pipe per sq. ft. of outside surface.	TRANSVERSE AREAS.		Length of pipe containing one cu. ft.	Weight per foot of length.	No. of threads per inch of screw.
	Internal.	External.			
Feet.	Inches.	Inches.	Feet.	Lbs.	
9.44	0.0572	0.129	2500.0	0.243	27
7.075	0.1041	0.229	1385.0	0.422	18
5.657	0.1916	0.358	751.5	0.561	18
4.502	0.3048	0.554	472.4	0.845	14
3.637	0.5333	0.866	270.0	1.126	14
2.903	0.8627	1.357	166.9	1.670	11½
2.301	1.496	2.164	96.25	2.258	11½
2.01	2.038	2.835	70.65	2.694	11½
1.611	3.355	4.430	42.36	3.667	11½
1.328	4.783	6.491	30.11	5.773	8
1.091	7.388	9.621	19.49	7.547	8
0.955	9.887	12.566	14.56	9.055	8
0.849	12.730	15.904	11.31	10.728	8
0.765	15.939	19.635	9.03	12.492	8
0.629	19.990	24.299	7.20	14.564	8
0.577	28.889	34.471	4.98	18.767	8
0.505	38.737	45.663	3.72	23.410	8
0.444	50.039	58.426	2.88	28.348	8
0.394	63.633	73.715	2.26	34.077	8
0.355	78.838	90.762	1.80	40.641	8

LEAD PIPE.

Weight Per Lineal Foot.

Calibre.	Wt. Per Ft.		Caliber.	Wt. Per Ft.	
	Lbs.	Oz.		Lbs.	Oz.
⅛ inch tubing	.....	3½	1¼ inch light	3	0
¼ inch extra light	.....	4	medium	3	12
light	.....	6	strong	4	12
medium	.....	8	extra strong	6	0
strong	.....	10	1½ inch aqueduct	3	0
extra strong	1	2	extra light	3	8
⅜ inch aqueduct	0	8	light	4	0
light	0	12	medium	5	0
medium	1	0	strong	6	0
strong	1	8	extra strong	7	8
extra strong	2	0	1¾ inch extra light	3	12
½ inch aqueduct	0	10	light	4	8
extra light	0	12	medium	5	8
light	1	0	strong	6	8
medium	1	4	extra strong	8	0
strong	1	12	2 inch waste	3	0
extra strong	2	8	2 inch extra light	4	0
⅝ inch aqueduct	0	12	light	5	0
extra light	1	4	medium	7	0
light	1	12	strong	8	0
medium	2	0	extra strong	9	0
strong	2	8	2½ inch 3-16 thick	8	0
extra strong	3	0	¼ thick	11	0
¾ inch aqneduct	1	0	5-16 thick	14	0
extra light	1	8	⅜ thick	17	0
light	2	0	3 inch waste	5	0
medium	2	4	3-16 thick	9	0
strong	3	0	¼ thick	12	0
extra strong	3	8	5-16 thick	16	0
⅞ inch aqueduct	1	8	⅜ thick	20	0
extra light	2	0	3½ inch ¼ thick	15	0
light	2	8	5-16 thick	18	0
1 inch aqueduct	1	8	⅜ thick	21	0
extra light	2	0	4 inch waste	5	0
light	2	8	¼ thick	16	0
medium	3	4	5-16 thick	21	0
strong	4	0	⅜ thick	25	0
extra strong	4	12	7-16 thick	30	0
1¼ inch aqueduct	2	0	4½ inch waste	6	0
extra light	2	8	5 inch waste	8	0

WEIGHTS AND SIZES OF SHEET LEAD.

Pounds Per Square Foot	2½	3	3½	4	4½	5	6	7	8	9	10	11	12
Wire Gauge No	19	18	17	16	15	14	13	12	11	10	9	8	7

A square foot of Sheet Lead 1-16 of an inch thick, weighs 4 pounds.

MANILLA ROPE.

Weight per 100 Feet and Strength in Pounds.

Size in Diameter.	Weight of 100 Feet.	Strength of New Rope.
1-4 inch	3 lbs.	450 lbs.
5-16 "	4 "	750 "
3-8 "	5½ "	900 "
7-16 "	7 "	1,250 "
1-2 "	8 "	1,700 "
9-16 "	11 "	2,300 "
5-8 "	15 "	3,000 "
3-4 "	17 "	4,000 "
13-16 "	21 "	5,000 "
7-8 "	25 "	5,800 "
1 "	33 "	7,000 "
1 1-16 "	36 "	8,000 "
1 1-8 "	42 "	9,200 "
1 1-4 "	46 "	11,000 "
1 3-8 "	54 "	13,500 "
1 7-16 "	62 "	15,500 "
1 1-2 "	67 "	17,000 "
1 5-8 "	84 "	19,900 "
1 3-4 "	100 "	23,500 "
2 "	120 "	29,300 "
2 1-4 "	142 "	37,000 "
2 3-8 "	170 "	42,000 "
2 1-2 "	192 "	48,000 "
2 3-4 "	217 "	54,000 "
2 7-8 "	243 "	61,000 "
3 "	276 "	67,000 "
3 1-2 "	350 "	96,000 "

WEIGHT OF GRINDSTONE.

RULE—Square the diameter (in inches); multiply by thickness (in inches); then by the decimal .06363; the product will be the weight of the stone in pounds.

WINDOW GLASS.

Number of Lights in Box of 50 Feet.

Size.	No. Lights.	Size.	No. Lights.	Size.	No. Lights.
6 x 8	150	15 x 18	27	24 x 34	9
7 x 9	115	20	24	36	9
8 x 10	90	22	22	38	8
11	82	24	20	40	8
12	75	26	19	26 x 32	9
13	69	16 x 20	23	34	8
14	64	22	21	36	8
9 x 12	67	24	19	38	7
13	62	26	17	40	7
14	57	28	16	42	7
15	53	30	15	44	6
10 x 13	56	18 x 22	18	28 x 36	7
14	52	24	17	38	7
15	48	26	16	40	7
16	45	28	14	42	6
11 x 14	47	30	14	44	6
15	44	32	13	46	6
16	41	20 x 26	14	48	5
18	39	28	13	50	5
12 x 15	40	30	12	30 x 38	7
16	38	32	11	40	6
18	34	34	11	42	6
20	30	36	10	44	6
13 x 16	35	22 x 28	12	46	5
18	31	30	11	48	5
20	28	32	10	50	5
22	25	34	10	52	5
14 x 18	29	36	9	54	4
20	26	38	9	32 x 40	6
22	24	24 x 30	10	42	6
24	22	32	10	.....	..

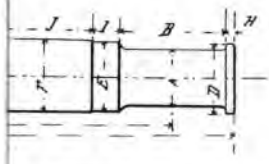
WINDOW GLASS—(Continued.)

Number of Lights in a Box of 50 Feet.

Size.	No. Lights.	Size.	No. Lights.	Size.	No. Lights.
32 x 44	5	36 x 60	3	40 x 68	3
46	5	62	3	70	3
48	5	64	3	42 x 50	3
50	5	38 x 46	4	52	3
52	4	48	4	54	3
54	4	50	4	56	3
56	4	52	4	58	3
34 x 44	5	54	4	60	3
46	5	56	3	62	3
48	5	58	3	64	3
50	4	60	3	66	3
52	4	62	3	68	3
54	4	64	3	70	2
56	4	66	3	44 x 54	3
58	4	40 x 48	4	56	3
60	4	50	4	58	3
36 x 46	4	52	3	60	3
48	4	54	3	62	3
50	4	56	3	64	3
52	4	60	3	66	2
54	4	40 x 62	3	68	2
56	4	64	3	70	2
58	3	66	3	72	2

WEIGHT OF SKYLIGHT AND FLOOR GLASS PER SQUARE FOOT.

Thickness in Ins.	1/8	3/16	1/4	3/8	1/2	5/8	3/4	1
Weight.	1.75	2.62	3.5	5.35	7	8.75	10.5	14



Road	L	M	Wt.	Remarks.
C. & N. W.	6′–3 ″	6′–11¼ ″	411	.....
" "	6 –3	7 – 0¼	469	.....
Pullman 3 1/16 ″	6 –2½	6 –11¼	440	.....
W. N. V. & 16	6 –4¾	7 – 2	499	.....
Pullman 2½	4 –7	5 – 2¼	226	3¼ Ctr. 218
C. & N. P.	6 –3	6 –11¼	429	.....
Armour . .	6 –3	.....	448	.....
B. & O. . 5/16	6 –3	7 – 0¼	492	Steel, 495.
B. C. R. &	6 –3	6 –11¼	390	.....
H. & B. T.	6 –3	7 – 0¼	416	.....
Sav. & Fla¼	6 –4	7 – 0¼	449	.....
Mex. Cent.	6 –3	6 –11¼	420	.....
F. E. & M.	4 –7	5 – 2¼	300	.....
C. & E. I.	6 –3	6 –11½	397	.....
M. U. & W.	.....	6 –11½	420	.....
Vand. Bag/8	6 –2¾	6 –11	372	Steel, 379.
C. &. E. I. 8	6 –4½	7 – 2	454	.....
Armour Bd	6 –3	6 –11¼	426	.....
B. C. R. &	6 –2	6 – 9½	326	.....
Nor. & We	.....	7 – 0¼	430	Steel.
P. & R. Pa	.....	7 – 2¾	408½	.....
C. & E. I.	6 –4¾	7 – 2	439	.....
Old Col.	6 –3	6 –11¼	444	.....
C. R. I. & P	6 –3	7 – 0¼	478	Steel.
U. P. No.	.....	5 – 0	242	.....
Monon	6 –3	6 –11¼	420	.....
Penn. 8	6 –4¾	7 – 2	446	Steel.
E. J. & E. 8	6 –4¾	7 – 2	499	.....
N. Morris	6 –3	6 –11¼	408	.....
D. & I. R.	6 –3	6 –11¼	418	.....
U. P. No.	6 –3	6 –11¼	391	.....
M. C. B. (	6 –3	6 –11¼	385	.....
D. & W.	6 –3	6 –11¼	428	.....
U. P. No.	.....	6 – 6¾	335	.....
Cudahy Re	6 –3	6 –11¼	434	.....

APPENDIX.

INCLUDING PENNSYLVANIA RAILROAD COMPANY'S SPECIFICATIONS FOR THE VARIOUS MATERIALS ENTERING INTO FREIGHT CAR CONSTRUCTION.

The quality of material entering into the construction of Railroad Equipment is of such importance as to have caused the larger Railroad Systems of the country to establish a laboratory and appoint a staff of inspectors, chemists, etc., whose sole duty it is to prepare specifications showing the composition and quality of material required for a particular purpose, and then to inspect and receive material, thus assuring the receipt of materials in accordance with specifications.

There are, however, a still larger number of smaller railroads in the country who are unable to stand the expense connected with the maintenance of such a staff, and frequent reference is made to the specifications of one or the other of the systems who do maintain such forces, and the question is very often asked: What is the Pennsylvania Standard?

For the purpose of affording a ready answer to this question, a copy of the latest specifications of the Pennsylvania Railroad for all materials entering into freight car construction is herewith presented.

PENNSYLVANIA RAILROAD COMPANY'S SPECIFICATIONS FOR LUMBER.

No. 33, B.

SPECIFICATION No. 1.

"Roofing." Double board for Box Cars.

Must be White Pine. It shall consist of 1st, 2d and 3d clear strips. The poorest strip must be free on one side of knots, and shall not show more than 1½ inches of sap on the heart

face side, and not more than three inches of sap on the opposite side, or its equivalent if otherwise distributed over the faces. No shipment will be accepted if it contains more than 20 per cent. of the poorest strips described. When roofing is ordered "finished," the grooves must be worked on the face which contains the knots.

SPECIFICATION No. 2.

"Car Siding."

It shall consist of A and B strips of 2d and 3d clear quality. The poorest strip in this assortment shall, at the length of 16 feet, not have more than 5 sound knots not over one inch in diameter and not liable to fall out when seasoned, and shall not contain over 1½ inches of bright sap in a width of 6 inches, and must be entirely free from splits, shakes and rot. The different grades above described must be furnished in equal proportions, but the lowest line strips shall not exceed 25 per cent. of the whole quantity.

SPECIFICATION No. 3.

"D Flooring."

Shall be a good grade of common flooring. There may be a number of small knots, but none at the edges that will damage the piece by dressing and matching. The poorest strip shall not contain in a width of six inches on the heart face side more than 2 inches of sap, and not more than 3½ inches of sap on the opposite side, or its equivalent if otherwise distributed over the faces. It must be free from through shakes and large or loose knots. No shipment must be accepted if it contains more than 25 per cent. of the poorest strips described. Norway Pine of this character may be used for lining purposes, but for roofing White Pine must be used.

SPECIFICATION No. 4.

"Common."

Shall be of the grade known in the market grading as "Common." Must be good, sound lumber 10 feet long and upward. The knots must be tight and sound, and not coarse enough to weaken the board. Sap boards may be accepted, if the sap is fairly bright. Splits or shakes if straight, and not of an extent or nature to injure the board, are allowable.

SPECIFICATION No. 5.
"No. 2 D Stock."

This is a selection known at this Company's yard as "No. 2 D Stock" boards, strictly a grade between No. 1 Common and No. 1 D Stock. It shall be inspected in accordance with the following specifications: Must be White Pine. The width shall be 8, 10 or 12 inches, as required. All round knots must be sound and not over 2 inches in diameter, fairly intergrown to prevent falling out. Cat knots that do not weaken the boards are not objectionable. If there are only a few knots they may be larger, provided they do not impair the strength of the boards. A split 12 inches long at one end, if straight, may be accepted, but such boards shall not exceed 5 per cent. of the whole amount.

SPECIFICATION No. 6.
"A Select."

To be White Pine. Its width will vary from 8 to 30 inches. It must be free from splits and shakes up to 15 inches wide. Above this width shakes may be allowed where the use and general value of the piece is not seriously impaired thereby. Knots may be allowed according to size of board and location of knots, but both knots and shakes shall not be allowed. Sap may be allowed equal to 2 inches on one side of a 9 inch piece, increasing with the width and thickness.

SPECIFICATION No. 7.
" B Select."

Must be White Pine. Widths from 7 to 14 inches and upwards. In boards 7 to 10 inches wide, one side must be free from sap, and the opposite side may be one-half covered with sap. In the absence of sap, three sound knots not over one inch in diameter or their equivalent may be allowed. In wider or thicker lumber, additional defects may be allowed in proportion to the increased width or thickness. In every case, sap boards and cuttings will be excluded.

SPECIFICATION No. 8.
"2d Clear White Pine."

Shall be not less than 10 inches wide and must be perfect up to 11 inches. Above 11 inches imperfections may be

allowed equal to sap 1 inch on one side of the whole length of the piece, if well manufactured. With increasing width will allow other and larger imperfections in proportion to the width, but not of such a character as to decrease its value beyond the standard of a 12 inch piece of above description.

SPECIFICATION No. 9.
"B Stock."

White Pine. Will be inspected and graded as "A Select," with the exception of less sap and more knots proportionately. The boards must be of the uniform width ordered.

SPECIFICATION No. 10.
"White Pine, Yellow Pine and Norway Pine Flooring."

In plank, nine inches and under wide, the poorest piece shall show one heart face and not less than two-thirds heart on opposite side throughout its length. Over nine inches wide, the poorest piece shall show not less than two-thirds heart on both sides throughout, all free from shakes, large or unsound knots.

Manufactured flooring must be six inches wide and the poorest piece shall show one entire heart face and not less than two-thirds heart on the opposite side throughout its length, clear of splits, shakes, or knots exceeding one inch in diameter or more than four in a board. The location of the knots must be such as not to impair the usefulness or strength of the piece, nor occur where the boards are tongued and grooved.

Not more than 40 per cent. of the "low line" pieces will be accepted under this specification.

SPECIFICATION No. 11.
"Piece Stuff."

To be of Norway or White Pine. It will be ordered of the following dimensions, as required: 2x4, 2x6, 2x8, 2x10, 2x12, 2x14, and 3 inches thick of any required widths; also 4x4 and 4x8. This lumber will be inspected under the following specifications: Must be free from bad splits and shakes, especially when not straight. This lumber should be of full standard thickness and well manufactured. A few worm holes are not objectionable in dimension stuff, unless enough in number to weaken the piece or of a generally unsightly character. The knots must be tight and sound and not coarse enough to weaken the piece.

SPECIFICATION No. 12.
"1st and 2d Clear Yellow Pine."

When ordered two inches thick, the poorest piece must be free from all imperfections up to 5 inches wide. Above 6 inches wide, imperfections may be allowed equal to sap 1 inch on one side of the whole length of the piece if well manufactured. With increasing width will allow other and larger imperfections in proportion to the width, but not enough to decrease its value beyond the standard of a 6 inch piece of above description. Two sound standard knots in the poorest piece may be allowed when there is no sap. If ordered of greater thickness, defects will be allowed in proportion.

SPECIFICATION No. 13.
"Yellow Pine and Norway Pine."

For Side Sills, Stringers, Plates, Side Planks and Roof Ribs.

Must be cut from live trees. Sound knots not exceeding 1½ inches in diameter will be allowed, provided the number or location of same does not impair the strength or durability of the pieces for the purpose intended.

Must be free from splits, shakes, decay in form of red streaks, showing on end or face of the stick (generally known as "red heart") or other defects that will impair the strength or durability for the purpose intended.

Sap will be allowed to the extent shown in sketches 1, 2, 3, 4 and 5. If as shown in sketches 6, 7 and 8, the pieces will be rejected.

Yellow Pine must be long leaf Virgin Pine, cut in the interior of the yellow pine belt in Georgia, Florida, Alabama or Mississippi.

No short leaf yellow pine or loblolly will be accepted.

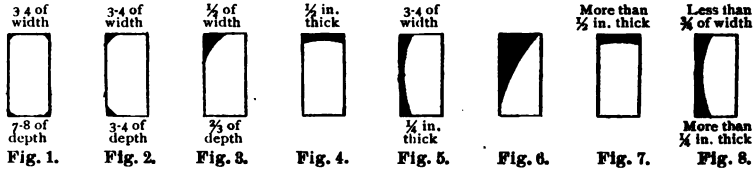


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7. Fig. 8.

SPECIFICATION No. 14.
"Oak Flooring."

Must be free from sap on one side. Knots to be sound and not exceeding 1½ inches in diameter. Must be free from shakes and splits.

SPECIFICATION No. 15.

"Oak."

Must have three corners free from sap. Sound knots allowed, providing their location and size are such as not to impair the strength and durability of the piece. Must be free from shakes and splits.

SPECIFICATION No. 16.

"Quartered White or Burr Oak."

Must be White or Burr Oak, and must be manufactured by band saw. It shall be graded and inspected as 1st and 2d clear. The width must be 6 inches and upwards. Must be free from all defects up to 8 inches in width. In pieces up to 11 inches wide, from one to two standard knots may be allowed, and more knots in proportion to the greater width. The entire face of the board must show the figures brought out by proper quartering. Five per cent. of the quantity ordered must be 16 inches wide and upwards; 15 per cent. to be 13 inches wide and upwards; 20 per cent. nine inches wide and upwards, and the remaining 60 per cent. 6 inches and upwards. This lumber being required for ornamental purposes only must be manufactured from large logs by band saw. Such logs cannot be sawed satisfactorily with circular saws.

SPECIFICATION No. 17.

"1st and 2d Clear White Ash."

Firsts and Seconds must be 8 inches wide and over. At 8 inches, defects may be allowed equivalent to two standard $1\frac{1}{2}$ inch knots, and an allowance of more defects may be made in proportion to the increased width and thickness. Must be free from hearts and dry rot. Sap shall not be considered a material injury if bright and in good condition.

NOTE.—White Ash cut in Ohio and Indiana is preferred. According to the North-Western Lumberman, this ash is of better quality than that cut in Pennsylvania and West Virginia, which is quoted at $10.00 per thousand less than the former. North Carolina Ash is quoted at $18.00 per thousand less than the former.

SPECIFICATION No. 18.
"1st and 2d Clear Yellow Poplar."

First clear must be 10 inches or more in width and free from all defects. Second clear shall not be less than 8 inches in width and clear up to 10 inches, but at 10 inches may have two knots of standard size or bright sap. If the piece be wider, more standard knots may be allowed in proportion to the width. The two grades above enumerated may be combined in one grade, to be designated as firsts and seconds, in which the proportion of second clear shall not exceed 50 per cent. of the whole quantity.

NOTE.—The poplar wanted for passenger car work should be Yellow Poplar, cut in Ohio or Indiana if possible to obtain it. If not, the best quality of West Virginia or Pennsylvania Poplar should be procured. The cost of the former is from $3.00 to $5.00 per thousand more than the latter. In no case should white or gray poplar be ordered, as it is not suitable for passenger car work.

SPECIFICATION No. 19.
"1st and 2d Clear Oak.

To be of second growth White or Burr Oak, manufactured from butt logs, large enough to leave the heart in the center. Must be free from unsound knots, splits or shakes. Sound knots not exceeding 1½ inches in diameter may be allowed, if they do not affect the strength of the piece.

NOTE.—It is not possible to obtain all the end sills required for freight cars under these specifications. If any are furnished, the heart in which is not in the center, they should be accepted, provided they are otherwise free from the defects mentioned in this specification.

SPECIFICATION No. 20.
"2d Clear Oak."

To be White or Burr Oak of the grade known as 2d Clear, free from loose or unsound knots, splits or shakes. Pieces having sound knots so located as to impair their strength and durability must be rejected.

SPECIFICATION No. 21.
"2d Clear Oak or Hickory."

The Oak required for this purpose must be White or Burr Oak of the grade known as 2d Clear, and must be manufac-

tured from tough butt logs. It must be free from large or unsound knots, splits or shakes. Pieces having sound knots so located as to impair their strength or durability will be rejected. The hickory must be pig nut or shell bark, and will be inspected for defects precisely as is the case with oak.

SPECIFICATION No. 22.
"1st Clear Yellow Pine."

To be of the same grade as 1st Clear White Pine, and to be straight grained, clear of all sap and heart checks.

SPECIFICATION No. 23.
"Select Common Norway or Yellow Pine."

To be free from rot, large or loose knots and practically free from sap.

SPECIFICATION No. 24.
"No. 1 Common White Pine."

To be sound knotted, (none of which would be liable to leak), free of sap on one side, the other side to be three-fourths free of sap and to be free from shakes and splits.

SPECIFICATION No. 25.
"1st Clear White or Burr Oak."

Must be 1st Clear—must be cut from second growth butt logs.

SPECIFICATION No. 26.
"Telegraph Cross Arms."

Must be made of seasoned Norway Pine, White Pine or Spruce. To be furnished of lengths as ordered, or multiples of same. It must be straight grained, sound, and must not contain splits or shakes. No piece shall show more than 25 per cent. sap, and no large, loose or unsound knots will be allowed. Knots not larger than 9-10 inch will be permitted if they do not impair the strength of the piece.

SPECIFICATION No. 27.
"Push Poles."

Must be of Oregon Fir. Heart Lumber, sound, free from shakes, splits and knots.

Office of the General Supt. Motive Power,
Altoona, Pa., October 19, 1895.

SPECIFICATIONS FOR STEEL CASTINGS

Superseding Specifications dated April 7th, 1888.

No. 36.

Steel castings should have a tensile strength of 70,000 lbs. per square inch and an elongation of 15 per cent. in section originally 2 inches long. Steel castings will not be accepted if tensile strength falls below 60,000 lbs. nor if the elongation is less than 12 per cent., nor if castings have blow holes and shrinkage cracks.

When specified on drawings, castings must have cast with them a strip to be used as a test piece. The dimensions of this strip must be ¾ inch square by 12 inches long.

Test pieces and castings with which they are cast must be marked so as to be readily identified when separated.

Dated:
Office of the General Supt. Motive Power,
Altoona, Pa., November 7th, 1895.

SPECIFICATIONS FOR MERCHANT BAR IRON OR STEEL.

Superseding Specifications for Merchant Bar Iron, dated September 19th, 1891.

No. 9.

Miscellaneous merchant bar iron or steel for which no special specifications defining shapes and uses are issued, should have a tensile strength of 50,000 to 55,000 lbs. per square inch, and an elongation of 20 per cent. on section originally 2 inches long.

No iron or steel will be accepted under this specification if tensile strength falls below 48,000 lbs. or goes above 60,000 bls. per square inch, nor if elongation is less than 15 per cent. in two inches, nor if it shows a granular fracture covering more than 50 per cent. of the fractured surface, nor if it shows any difficulty in welding.

In preparing test pieces from round or rectangular bars, they will be turned or shaped, so that the tested sections may

be the central portion of the bar, in all sizes up to 1¾ inches in any diametrical or side measurement. In larger sizes, test pieces will be made to fall about half way from center to circumference.

Iron and steel will be measured for size and roundness with the P. R. R. standard limit gauges.

Round iron or steel will be rejected if it **cannot** enter the large or plus end of the gauge intended for it **in any way,** and can enter the small or minus end **in any way.**

Flat iron or steel will be rejected if it is 1-32 inch wider than the nominal width, and if its thickness varies from the nominal thickness more than is allowed by the limit gauges before mentioned.

Bars of iron ½ inch thick or less, or tortured forms of iron, such as angle, tee or channel bars will be accepted if tensile strength is above 45,000 lbs. and elongation above 12 per cent., but the testing of such sizes and sections is optional.

Dated:

Office of the General Supt. Motive Power,
Altoona, Pa., February 20th, 1893.

SPECIFICATIONS FOR AXLES.

Superseding Specifications for Axles, dated April 23, 1891.

No. 10 B.

1. This specification will cover the following axles, viz:

3½" x 7" journals and 4⅛" diameter at center to be known as P. R. R. Axle No. 1.

3¾" x 7" journals and 4 7/16" diameter at center to be known as P. R. R. Axle No. 2.

4"x8" journals and 4¾" diameter at center to be known as P. R. R. Axle No. 3.

4¼"x8" journals and 4¾" diameter at center to be known as P. R. R. Axle No. 4.

4¼"x8½" journals and 4¾" diameter at center to be known as Pullman Axle No. 5F.

4¾"x9" journals and 5¼" diameter at center to be known as P. R. R. Axle No. 6.

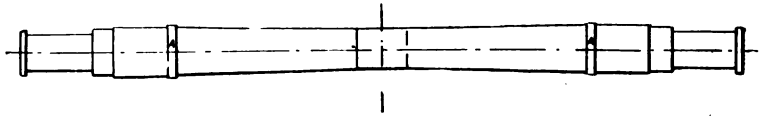
2. Axles will be ordered not less than 100 on one order. All axles must be made and finished in a workmanlike manner and must be free from cracks, or seams, or flaws which can be detected by the eye. All parts must be rough turned, except at point "A" on diagram below.

3. All axles must be made of steel and the material desired has the following composition:

Carbon	0.40	per cent.
Manganese, not above	0.50	" "
Silicon	0.05	" "
Phosphorus, not above	0.05	" "
Sulphur, not above	0.04	" "

4. All axles must conform in sizes, shapes and limiting weights to the requirements given on the order, or print sent with it. The rough turning must be done with flat nosed tool in such a way as to leave the surface free from ridges; and in centering them, 60 degree centers must be used. All axles must be legibly stamped on the unfinished portion "A" on diagram below, with the name of the maker and the blow or heat number.

Portions marked "A" to be Unfinished and to have stamped upon either of them blow number and maker's name.



5. Manufacturers must notify the General Superintendent of Motive Power, at Altoona, when they are ready to ship not less than 100 axles; must have all the axles made from each heat, and no others in a pile by themselves; must furnish the testing machine referred to in Section 7, and the proper appliances for checking the dimensions; must have a car or cars ready to receive shipment; must furnish the labor and power necessary to enable the Inspector to promptly inspect and test; and ship or store the axles when tests are finished. Axles which when offered for test are so rusty as to hide defects will not be considered.

6. A shipment of axles being ready for test, the Inspector will first make a list of the heat numbers in the various piles of axles offered, and the number of axles bearing the same heat number in each pile. If he finds in any pile axles bear-

ing different heat numbers, he must before going further have the pile re-arranged, so that only those axles having the same heat number will be in the same pile. Also, if he finds in any pile any axles having evidence of changed or defaced heat numbers, or any axles having heat numbers not clearly legible, or any bearing heat numbers previously rejected, he will exclude such axles from further consideration. He will then examine the axles in each pile or heat, as to workmanship and defects visible to the eye, and as to whether they conform to dimensions and directions on the order, or tracing, or in these specifications. All axles not satisfactory in these respects must be laid aside and will not be further considered. This being done, if less than thirty axles in any heat are left, he will refuse to consider that heat further. Not less than thirty axles from any one heat having passed the foregoing inspection, the Inspector will select from each pile or heat, one axle at random, and subject it to the physical test prescribed for such axles as may be under consideration. If the test axle fails to fill the physical requirements, all the axles from that heat of steel will be regarded as rejected, and none of them will at any time be considered again. If the test axle passes physical test, the Inspector will draw a straight line parallel with the axis of this test axle along the wheel fit, and prick punch this line at several points. He will then have a piece about 14 inches long cut off from the same axle, so as to leave some of the prick punch marks on each piece of the axle. The 14 inch piece must be sent at once properly tagged by R. R. S., to Charles B. Dudley, Chemist, Altoona, Pa. The piles of axles which have passed physical test will be allowed to remain as the Inspector leaves them, until the results of the chemical test are known. The 14 inch piece being received at the P. R. R. Laboratory, a line will be drawn from the prick punch line above described, through the center of the axle across the cut off end, and a prick punch mark made on this last line, 40 per cent. of the distance from the center to the circumference of the axle. Borings for analysis will be taken by means of a $\frac{5}{8}$ inch diameter drill, acting parallel to the axis of the axle, and starting with its center in the last described prick punch mark. The borings will be analyzed in accordance with P. R. R. Standard Methods, and the results of the analysis will be communicated to the Inspector, who will at once proceed to the works, and reject, or accept and ship, or mark and store, as the case may be, the axles in question. If the analysis of any test axle shows

that the steel does not meet the chemical requirements, all the axles of that heat will be regarded as rejected, and none of them will at any time be considered again. If the analysis of any test axle shows that the steel meets the chemical requirements, all the axles of that heat which have passed inspection and physical test will be regarded as accepted. The Inspector will proceed to load and ship from the accepted axles, as many as may be required to fill the order. If, as the result of inspection and the physical and chemical tests, more axles are accepted than the order calls for, such accepted axles in excess will be stamped by the Inspector with his own name, and will then be piled and allowed to remain at the works, subject to further orders from the purchasing agent. On receipt of further orders, axles once accepted, will of course not be subject to further test, but in no case will even accepted axles be loaded and shipped, except in the presence of the Inspector. In all cases the Inspector will keep an accurate record of the heat numbers, of the number of axles in each heat which are rejected, accepted, or stored, and will transmit this information with each report.

7. All axles will be tested physically by drop test. The testing machine must conform in its essential parts to drawing which will be furnished by the Pennsylvania R. R. Co. These essential parts are: the points of supports on which the axle rests during test must be three feet apart from center to center, the tup must weigh 1,640 lbs., the anvil which is supported on springs must weigh 17,500 lbs., it must be free to move in a vertical direction, the springs upon which it rests must be twelve in number of the kind described in P. R. R. Specifications No. 12 B, as Class H 13, and the radius of the supports and of the striking face on the tup in the direction of the axis of the axle must be five inches.

When an axle is tested, it must be so placed in the machine that the tup will strike it midway between the ends, and it must be turned over after the first and third blows. After the first blow, the deflection of the axle under the test will be measured in the manner specified below.

8. It is desired that the various kinds of axles when tested under the drop as specified above, should stand, without rupture or fracture in any way, or without exceeding after the first blow the deflections given herewith, five blows from the heights specified, viz:

Axle	Heights.	Deflections
P. R. R. Axle No. 1	23½ feet	7¼ inches
P. R. R. Axle No. 2	28½ feet	7 inches
P. R. R. Axle No. 3	34 feet	7 inches
P. R. R. Axle No. 4	34 feet	7 inches
Pullman Axle No. 5F	34 feet	7 inches
P. R. R. Axle No. 6	43 feet	6¾ inches

9. Axles will be considered to have failed on physical test and will be rejected, if when tested under the drop as specified above, they rupture or fracture in any way as a result of five blows from the heights specified below, or if the deflections after the first blow exceed those given below, viz:

Axle	Heights.	Deflections
P. R. R. Axle No. 1	23½ feet	8¼ inches
P. R. R. Axle No. 2	28½ feet	8 inches
P. R. R. Axle No. 3	34 feet	8 inches
P. R. R. Axle No. 4	34 feet	8 inches
Pullman Axle No. 5F	34 feet	8 inches
P. R. R. Axle No. 6	43 feet	7¾ inches

10. Axles will be considered to have failed on chemical test and will be rejected if the analysis of the borings taken as above described gives figures for the various constituents below outside the following limits, viz:

Carbon, below 0.35 per cent. or above 0.50 per cent.
Manganese ..... above 0.60 " "
Phosphorus ..... above 0.07 " "

In order to measure the deflection, prepare a straight edge as long as the axle, by reinforcing it on one side, equally at each end, so that when it is laid on the axle the reinforced parts will rest on the collars of the axle, and the balance of the straight edge not touch the axle in any place. Next place axle in position for test, lay the straight edge on it, and measure the distance from the straight edge to the axle at the middle point of the latter. Then after the first blow, place the straight edge on the now bent axle in the same manner as before, and measure the distance from it to that side of the axle next to the straight edge at the point farthest away from the latter. The difference of the two measurements is the deflection.

Dated:

Office of the General Supt. Motive Power,
Altoona, Pa., January 23, 1896.

SPECIFICATIONS FOR 33 INCH CAST IRON WHEELS.

Superseding Specifications for 33 Inch Cast Iron Wheels, dated June 8th, 1891.

No. 14 A.

The wheels desired under this specification are those only that are made from the best materials, and in accordance with the best modern foundry practice. All wheels must fill the requirements given below.

1. Wheels will be ordered in lots of 100, or multiples of the same, and for each one hundred ordered, three extra wheels must be furnished for test. These test wheels will be selected by the Inspector at random from the lot offered for test.

2. All wheels must conform in general design and in measurements to drawings which will be furnished on application. Any departure from the standard design and measurements must be only by special permission in writing.

3. Wheels for use with P. R. R. Axles No. 4 or smaller, must weigh not less than 540 pounds, and not more than 575 pounds. Wheels for use with P. R. R. Axles No. 6, must weigh not less than 595 pounds, nor more than 620 pounds.

4. Each wheel must have plainly cast upon some part of the plates the name of the maker. Where the maker has more than one foundry, the wheel must also bear a mark showing at which foundry the wheel was cast. Each wheel must also have cast on the inside double plate the date of casting, and a serial foundry number. No wheel bearing a duplicate number or a number once passed upon, will be considered. Also no wheel bearing an indistinct number or date, or any evidence of an altered or defaced number or date, will be considered further.

5. All wheels offered for inspection, must have been measured with P. R. R. standard tape measure, and must have the shrinkage number stencilled in plain figures on the inside double plate of the wheel. When ready for inspection, the wheels must be arranged in rows according to shrinkage numbers, all wheels of the same date being grouped together.

6. The body of wheels must be smooth and free from slag and blow holes, and hubs must be solid and as free as possible from drawing. Wheels will not be accepted in which the drawing extends further around than two-thirds of the circum-

ference of the center core. Tread and throat of wheels must be smooth, free from deep and irregular wrinkles, slag, sand wash, chill cracks and from any external evidence of hollow rims, and throat must be practically free from sweat.

7. Wheels tested must show soft, clean gray iron, free from defects, such as holes containing slag or dirt, more than ¼ inch in diameter, or clusters of such holes, honey-combing of iron in the hub, white iron in the plates or hub, or clear white iron around anchors or chaplets at a greater distance than ½ inch in any direction. The depth of clear white iron must not exceed ⅜ inch at throat and 1 inch at middle of tread, nor be less than ⅜ inch at throat and ⅝ inch at middle of tread. The blending of the white iron with the gray iron behind it, must be without any distinct line of demarkation, and the iron must not have a mottled appearance in any part of the wheel at a greater distance than 1⅝ inches from the tread or throat.

8. Manufacturers must notify the General Superintendent of Motive Power, at Altoona, Pa., when they are ready to ship not less than 100 wheels, must await the arrival of the Company's Inspector, must have a car or cars ready to be loaded with the wheels, and must furnish the facilities and labor needed to enable the Inspector to inspect, test and load, and ship the wheels promptly. The wheels offered for inspection, must not be covered with any substance that will hide defects.

9. A hundred or more wheels being ready for test, the Inspector will make a list of the wheel numbers, at the same time examining each wheel for defects. Any wheels which fail to conform to the specifications by reason of defects, must be laid aside, and will not be accepted for shipment.

10. The Inspector will also re-tape not less than 10 per cent. of the wheels offered for test, and if he finds any showing wrong tape marking, he will tape the whole lot and require them to be re-stencilled, at the same time having the old stencil marks obliterated. He will weigh and make check measurements of at least 10 per cent. of the wheels offered for test, and if any of these wheels fail to conform to the specification, he will weigh and measure the whole lot, refusing to accept for shipment any wheels which fail in these respects.

11. The Inspector will select three wheels for test. One of these wheels must be tested as follows: The wheel must be placed flange downward in an anvil block weighing not less than one thousand, seven hundred (1,700) pounds, set on rubble masonry two (2) feet deep, and having three (3) supports not more than 5 inches wide, for the flange of the wheel to

rest upon; it must be struck centrally upon the hub by a weight of one hundred and forty (140) pounds falling from a height of twelve (12) feet. Should the wheel break in two or more pieces after twelve (12) blows or less, the 100 wheels represented by this test wheel, will be rejected. Should the wheel tested stand twelve (12) blows, without breaking in two or more pieces, the one hundred wheels represented by it will be regarded as satisfactory as to this test. A machine for making these tests is shown on drawings which will be furnished on application.

12. The other two test wheels must each be tested as follows: The wheels must be laid flange down in the sand, and a channel way 1½ inches wide, and four inches deep, must be moulded with green sand, around the wheel. The clean tread of the wheel must form one side of this channel way, and the clean flange must form as much of the bottom, as its width will cover. The channel way must then be filled to the top with molten cast iron, which must be hot enough when poured, so that the ring which is formed, when the metal is cold, shall be solid or free from wrinkles or layers. The time when the pouring ceases must be noted, and two minutes later an examination of the wheel must be made. If the wheel is found broken in pieces, or if any crack in the plates extends through the tread in either of the wheels tested, the 100 wheels represented by the two test wheels, will be rejected. Some wheels under this test burst with some violence before the metal has become solid, throwing the molten metal some distance. As it takes about one minute for the metal to solidify, it is well to use a little precaution for that time. In order to avoid spitting during pouring, the tread and inside of flange of wheel submitted to thermal test, should be covered with a coat of shellac.

13. All wheels which pass inspection and test will be regarded as accepted, and may be either shipped or stored for future shipment, as the needs of the service indicate. It is desired that shipments should as far as possible, be in lots of 100 hundred wheels. In all cases the Inspector must give in his report, the wheel numbers of all wheels inspected, and the disposition made of them.

14. Individual wheels will be considered to have failed and will not be accepted or further considered, which

1st.—Do not conform to standard design and measurements.

2nd.—Are under or over weight.

3rd.—Have the physical defects described in Section 6.

ference of the center core. Tread and throat of wheels must be smooth, free from deep and irregular wrinkles, slag, sand wash, chill cracks and from any external evidence of hollow rims, and throat must be practically free from sweat.

7. Wheels tested must show soft, clean gray iron, free from defects, such as holes containing slag or dirt, more than ¼ inch in diameter, or clusters of such holes, honey-combing of iron in the hub, white iron in the plates or hub, or clear white iron around anchors or chaplets at a greater distance than ½ inch in any direction. The depth of clear white iron must not exceed ⅞ inch at throat and 1 inch at middle of tread, nor be less than ⅜ inch at throat and ⅝ inch at middle of tread. The blending of the white iron with the gray iron behind it, must be without any distinct line of demarkation, and the iron must not have a mottled appearance in any part of the wheel at a greater distance than 1⅝ inches from the tread or throat.

8. Manufacturers must notify the General Superintendent of Motive Power, at Altoona, Pa., when they are ready to ship not less than 100 wheels, must await the arrival of the Company's Inspector, must have a car or cars ready to be loaded with the wheels, and must furnish the facilities and labor needed to enable the Inspector to inspect, test and load, and ship the wheels promptly. The wheels offered for inspection, must not be covered with any substance that will hide defects.

9. A hundred or more wheels being ready for test, the Inspector will make a list of the wheel numbers, at the same time examining each wheel for defects. Any wheels which fail to conform to the specifications by reason of defects, must be laid aside, and will not be accepted for shipment.

10. The Inspector will also re-tape not less than 10 per cent. of the wheels offered for test, and if he finds any showing wrong tape marking, he will tape the whole lot and require them to be re-stencilled, at the same time having the old stencil marks obliterated. He will weigh and make check measurements of at least 10 per cent. of the wheels offered for test, and if any of these wheels fail to conform to the specification, he will weigh and measure the whole lot, refusing to accept for shipment any wheels which fail in these respects.

11. The Inspector will select three wheels for test. One of these wheels must be tested as follows: The wheel must be placed flange downward in an anvil block weighing not less than one thousand, seven hundred (1,700) pounds, set on rubble masonry two (2) feet deep, and having three (3) supports not more than 5 inches wide, for the flange of the wheel to

SPECIFICATIONS FOR PHOSPHOR BRONZE BEARING METAL.

No. 32.

From this date Phosphor Bronze Bearing Metal will be purchased in amounts of 20,000 lbs, or some whole multiple of this number. Manufacturers will be required to notify the General Superintendent Motive Power, at Altoona, when they are ready to ship 20,000 lbs., and await the arrival of the Company's Inspector, and have proper assistance and all facilities ready for shipping the metal as soon as the Inspector arrives.

The Inspector will see the metal weighed and shipped, and will select three half pigs to represent the shipment. He will also be at liberty to reject any pigs in which want of uniformity in the constituents is evident to the eye.

Mixed borings from the three half pigs will be analyzed, and the shipment will be accepted or rejected on this analysis. The metal desired has the following composition:

Copper	79.70	per cent.
Tin	10.00	" "
Lead	9.50	" "
Phosphorus	0.80	" "

Shipments will not be accepted if the analysis as above described gives results outside the following limits: Tin, below 9.00 per cent., or over 11.00 per cent.; Lead, below 8.00 per cent., or over 11.00 per cent., and Phosphorus, below 0.70 per cent, or over 1.00 per cent., nor if the metal contains a sum total of any other substances than Copper, Tin, Lead and Phosphorus in greater quantity than 0.50 per cent.

Dated:

Office of the General Supt. Motive Power,
Altoona, Pa., April 14th, 1893.

PENNSYLVANIA RAILROAD COMPANY'S SPECIFICATIONS FOR HELICAL SPRINGS.

No. 12 B.

Superseding Specifications issued February 15th, 1894.

1. Helical Springs bought in accordance with these specifications, will be ordered from the manufacturers, only for the following shops, viz: Meadows, West Philadelphia,

15. Each 100 wheels submitted to test will be considered to have failed, and will not be accepted or considered further, if

1st.—The test wheels do not conform to Section 7, especially as to limits of white iron in the throat and tread, and around the chaplets.

2nd.—One of the test wheels does not stand the drop test as described in Section 11.

3rd.—Either of the other two test wheels does not stand the thermal test as described in Section 12.

Dated:

Office of the General Supt. Motive Power,
Altoona, Pa., 1896.

SPECIFICATIONS GRADING PIG IRON FOR CAR WHEELS BY CHILL TESTS MADE AT THE FURNACE.

The chill cup (one of which we furnish) is to be filled EVEN FULL at about the middle of every cast from the furnace by using a small ladle, or by placing the cup in the pig bed, a little below the level of the pigs, and letting the iron flow into it until it is EVEN FULL. The test piece so made will be $7\frac{1}{2}$ inches long, $3\frac{1}{2}$ inches wide and $1\frac{3}{4}$ inches thick, and is to be broken across the center when entirely cold. The depth of chill will be shown on the BOTTOM of the test piece, and is to be measured by the CLEAN WHITE PORTION TO THE POINT WHERE GRAY SPECKS BEGIN TO SHOW IN THE WHITE. The grades are to be by eighths of an inch, viz: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, etc., until the iron is mottled; the lowest grade being $\frac{1}{8}$ of an inch in depth of chill. The pigs of each cast are to be marked with the depth of chill shown by its test piece, and each grade is to be kept by itself at the furnace and in forwarding. At large anthracite and coke furnaces it is best to take three test pieces of each cast, viz: at the beginning, middle and end, and if there is a difference of an eighth of an inch or more in depth of chill between the first and last of the cast, the pigs should be divided into two or three portions, and graded by their respective chill tests.

Dated:

Office of the General Supt. Motive Power,
Altoona, Pa., March 2, 1883.

SPECIFICATIONS FOR PHOSPHOR BRONZE BEARING METAL.

No. 32.

From this date Phosphor Bronze Bearing Metal will be purchased in amounts of 20,000 lbs, or some whole multiple of this number. Manufacturers will be required to notify the General Superintendent Motive Power, at Altoona, when they are ready to ship 20,000 lbs., and await the arrival of the Company's Inspector, and have proper assistance and all facilities ready for shipping the metal as soon as the Inspector arrives.

The Inspector will see the metal weighed and shipped, and will select three half pigs to represent the shipment. He will also be at liberty to reject any pigs in which want of uniformity in the constituents is evident to the eye.

Mixed borings from the three half pigs will be analyzed, and the shipment will be accepted or rejected on this analysis. The metal desired has the following composition:

Copper	79.70	per cent.
Tin	10.00	" "
Lead	9.50	" "
Phosphorus	0.80	" "

Shipments will not be accepted if the analysis as above described gives results outside the following limits: Tin, below 9.00 per cent., or over 11.00 per cent.; Lead, below 8.00 per cent., or over 11.00 per cent., and Phosphorus, below 0.70 per cent, or over 1.00 per cent., nor if the metal contains a sum total of any other substances than Copper, Tin, Lead and Phosphorus in greater quantity than 0.50 per cent.

Dated:

Office of the General Supt. Motive Power,
Altoona, Pa., April 14th, 1893.

PENNSYLVANIA RAILROAD COMPANY'S SPECIFICATIONS FOR HELICAL SPRINGS.

No. 12 B.

Superseding Specifications issued February 15th, 1894.

1. Helical Springs bought in accordance with these specifications, will be ordered from the manufacturers, only for the following shops, viz: Meadows, West Philadelphia,

Wilmington, Baltimore, Renovo, Altoona, Machine, Altoona Car and Alleghany. Other shops will be supplied from these. The various classes of springs will be ordered in lots as stated in the detail specifications of each class.

2. Manufacturers will be furnished with prints showing the construction of the various classes, and the springs must conform to these prints, as well as to the detailed specifications given below, and on the prints. As there may be occasional changes in these prints, manufacturers must be sure that the tracing number and issue letter on the print they have is the same as the order specifies. In case of discrepancy between these specifications and the print, the print must be followed. Manufacturers must also notify the General Superintendent of Motive Power, at Altoona, when they are ready to ship not less than the number of springs given under the detail specifications of each class as the number in the lot to be ordered. In case springs are ordered "as the demands of the service indicate," manufacturers must notify only when they are ready to ship all the springs on the order. They must also await the arrival of the Company's Inspector, must furnish suitable reliable testing machines, and the proper color of paint, and must have ready a car or cars, and sufficient assistance to enable the Inspector to test, mark and ship the springs promptly. Also every coil made from bars 7-16 inch or over in diameter must be stamped with the maker's name and the figure designating the class of spring. This stamping must be on the side of the coil in all springs assembled between plates, and may be on the end of the coil for all other springs.

3. A shipment being ready for test, the Inspector will first inspect the lot of springs as to their conformity to the general requirements of the specifications, and then see how the outside dimensions, except the height, of at least 10 per cent. of the springs offered for test, compare with those given on the print, the object being to see whether the springs will go into the places for which they are designed. If he finds any differing in any outside dimensions, except the height, as much as $\frac{1}{8}$ inch from standard size, except as specified in Section 5, he will measure the whole shipment and exclude from further consideration, all springs which vary as much as this amount from standard size. He will then weigh at least ten per cent. of each kind of coils in the springs. If he finds any showing less than minimum weight, he will weigh every coil in the lot, and exclude from further consideration all coils which weigh less than the minimum allowed.

4. He will then test all springs as follows: Place each spring on a flat plate on one end and measure the distance between the plate and the other end of the spring by means of the standard depth gauge. This measurement is the free height of the spring. Second, place every spring either singly or in lots in the testing machine and apply a load at least 25 per cent. greater than the capacity of the spring; then measure the distance between the two plates of the machine. This measurement is the solid height of the spring. Third, remove the load and again take the free height at the same point in the circumference as the first free height was measured. If now, the second free height is less than the first by as much as 1-16 of an inch, the spring or springs will be regarded as having taken permanent set and will be excluded from further consideration. Also, all springs which, when tested as above, either break, or show variations from the free and solid heights specified below as much as $\frac{1}{8}$ of an inch, except as is provided in Section 5, will be excluded from further consideration. All springs of the classes so designated under the detail specifications which pass the above test, and are not subject to the tests in Sections 6 or 7, must be marked as described below and shipped at once in the presence of the Inspector.

5. All springs that are marked as subject to this section must not vary in heights or other outside dimensions over 1-32 of an inch.

6. In addition to the test, in Section 4, 10 per cent. of the springs of the classes so designated under the detail specifications, must be tested as per the detail specifications. If any of this 10 per cent. fail to fill the detail specifications, they will be excluded from further consideration, and the whole lot will then be tested in accordance with the detail specifications. All which fail will be excluded from further consideration, and all which pass detail test must be marked as described below and shipped at once in the presence of the Inspector.

7. In addition to the test in Section 4, all the springs of the classes so designated under the detail specifications, must be tested as per the detail specifications below. If any of these springs fail to fill the detail specifications, they will be excluded from further consideration, and all which pass the detail test must be marked as described below and shipped at once in the presence of the Inspector.

8. The marking of the springs is for purposes of identification after the springs arrive at destination. The marking must be done as follows: With a brush making a mark not

over $\frac{3}{8}$ inch wide, one straight, quick drying oil paint mark must be put on each spring, either inside or outside, but not on the ends. The kind of paint to be used varies according to the shop to which the shipment goes, as follows: For Meadow Shops, Red Lead; for West Philadelphia Shops, White Lead and Lamp Black, forming lead color; for Altoona Machine Shops, Chrome Green; for Altoona Car Shops, White Lead; for Baltimore Shops, Scarlet Lead Chromate; for Renovo Shops, Raw Umber; for Wilmington Shops, Chrome Yellow; for Allegheny Shops, Prussian Blue. If the number of springs offered for test at one time for any one shop is the same or less than the number stated under the detail specifications of each class as the number in the lot to be ordered, it is obvious that there will be one pile of springs each of which has one paint mark. But, if the number of springs to be shipped at any one time, to any one shop is greater than the number stated under the detail specifications of each class as the number in the lot to be ordered, such total number to be shipped must, before marking, be divided into piles of such size that each pile will contain the number of springs nearest to the number stated under the detail specifications of each class as the number in the lot to be ordered. The first pile must then be marked with one paint mark, the second with two, the third with three and so on. For example, if the springs are ordered in lots of 200, and 576 springs are to be shipped at one time to any one shop, there would be three piles, each containing 192 springs, and the first pile would be marked with one mark, the second with two, and the third with three. Where springs are ordered "in lots as the demands of the service indicate," if more than 100 springs are to be shipped to any one shop at any one time there must be two piles, and corresponding marking, if more than 200, three piles, etc.

9. Manufacturers must furnish for chemical test, one extra spring to represent each pile mentioned in the preceding section. These springs for chemical test, will be chosen by the inspector at random from the lot offered for test, and it is obvious there must be as many sample springs chosen as there are piles shipped to any one shop, and also as there are shops to which shipments are made, at one time. The whole sample spring for chemical test, or a piece not less than half a pound in weight, cut off from each coil in the spring, which is made from a different size bar, must be sent by R. R. S. to Charles B. Dudley, Chemist, Altoona, Pa. If the sample for chemical test is cut off hot, it must be cooled in such a way as not to

harden it. The sample spring or the portion cut off for chemical test must be stamped as soon as chosen with the Inspector's name and must be marked with the same kind of paint and in the same way as the pile of springs which it represents. Also each sample forwarded for chemical test must have attached to it a "sample for test" tag, properly filled out, and where several samples are forwarded in one package, they must be so packed that the marks will not be obliterated, and the tags will not be detached from the samples during transit.

10. The metal desired for springs is steel of the following composition:

Carbon	1.00	per cent.
Manganese	0.25	" "
Phosphorus, not above	0.05	" "
Silicon, not above	0·10	" "
Sulphur, not above	0.03	" "

11. An analysis will be made, in accordance with P. R. R. standard chemical methods, of the samples sent for chemical test as above described, and in case the carbon is found to be below 0.90 per cent., the manganese above 0.50 per cent., and the phosphorus above 0.07 per cent., the springs represented by the sample or samples will, at the option of the Railroad Company, be returned to the makers, or be retained and used at a deduction of 25 per cent. from the bill. The right is reserved of taking the borings for analysis from any part of the coil. It is understood and agreed that manufacturers may at any time within three weeks after analysis is made, claim a part of borings used for purposes of verification. Springs made from bars $\frac{1}{4}$ inch or less in diameter need not conform to the chemical limits above. Such springs will be rejected or subject to the deduction mentioned if the carbon is below c.50 per cent., the manganese above 1.00 per cent., and the phosphorus above 0.11 per cent.

DETAIL SPECIFICATIONS.

12. Each class of springs must be made in accordance with the tracing given under that class, and must meet the figures given below. The tracings of classes H 2, H 21, H 22, H 23, and H 47, show malleable cast iron plates $\frac{1}{4}$ inch thick. Thinner malleable cast iron or pressed steel plates may be used, but they should be not less than $\frac{1}{8}$ inch thick, and in this case the height of the coil must be maintained, but the total height

of spring, including plates, will be reduced to the extent of the decrease in thickness of the two plates.

CLASS H 1.
(Formerly Class A.)
Shown on Tracing No. 9321.

One bar, $\frac{1}{4}$ inch in diameter, $45\frac{1}{2}$ inches long, tapered to 47 inches. Ends ground.

Normal weight, 10 ounces; minimum weight, $9\frac{1}{2}$ ounces.

Outside diameter of coil, $1\frac{1}{4}$ inches.

Heights, $5\frac{1}{8}$ inches free; $3\frac{5}{8}$ inches solid; $4\frac{3}{8}$ inches with 250 pounds.

Capacity, 500 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 8, 9 and 11.

CLASS H 2.
(Formerly Class B.)
Shown on Tracing No. 9322.

Four bars, 15-16 inch in diameter, 46 inches long, tapered to $52\frac{3}{8}$ inches.

Normal weight of each bar, 8 pounds, $15\frac{1}{4}$ ounces; minimum weight, 8 pounds, 11 ounces.

Outside diameter of coils, 5 inches.

Caps of malleable iron or pressed steel.

Single coil, heights, $4\frac{5}{8}$ inches free; $3\frac{3}{8}$ inches solid; 4 inches with 3,250 pounds.

Capacity, 7,000 pounds.

Cluster of springs, heights excluding caps, $4\frac{5}{8}$ inches free; $3\frac{3}{8}$ inches solid; 4 inches with 13,000 pounds.

Capacity, 28,000 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 3.
(Formerly Class C.)
Shown on Tracing No. 9323.

One bar, $1\frac{1}{8}$ inches in diameter, $35\frac{3}{8}$ inches long, tapered to $41\frac{1}{4}$ inches.

Normal weight, 9 pounds, 15 ounces; minimum weight, 9 pounds, 10 ounces.

Outside diameter of coil, $4\frac{7}{8}$ inches.

Heights, $4\frac{1}{8}$ inches free; $3\frac{3}{8}$ inches solid; $3\frac{3}{4}$ inches with 6,000 pounds.

Capacity, 12,000 pounds.

Ordered in lots of 50. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 4.

(Formerly Class D.)

Shown on Tracing No. 9324.

One bar, 1 1-16 inches in diameter; $98\frac{7}{8}$ inches long, tapered to 105 inches.

Normal weight, 24 pounds, 12 ounces; minimum weight, 24 pounds, $\frac{1}{4}$ ounce.

Outside diameter of coil, 5 inches.

Heights, $10\frac{7}{8}$ inches free; $8\frac{1}{2}$ inches solid; $9\frac{3}{8}$ inches with 6,000 pounds.

Capacity, 9,570 pounds.

Ordered in lots of 50. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 5.

(Formerly Class E.)

Shown on Tracing No. 9325.

One bar, $\frac{1}{4}$ inch in diameter, $25\frac{1}{4}$ inches long, tapered to $28\frac{1}{4}$ inches. Ends ground.

Normal weight, 6 ounces; minimum weight, $5\frac{3}{4}$ ounces.

Outside diameter of coil, $2\frac{1}{4}$ inches.

Heights, $2\frac{1}{4}$ inches free; $1\frac{1}{8}$ inches solid; $1\frac{1}{2}$ inches with 164 pounds.

Capacity, 240 pounds.

Ordered in lots of 100. Must conform to Sections 2, 3, 4, 5, 8, 9 and 11.

CLASS H 6.

(Not previously classified.)

Shown on tracing No. 9326.

Three Bars:

1st bar, 1 3-16 inches in diameter, $99\frac{1}{8}$ inches long, tapered to $109\frac{3}{4}$ inches.

2nd bar, 13-16 inch in diameter, $99\frac{1}{8}$ inches long, tapered to $106\frac{1}{2}$ inches.

3rd bar, 9-16 inch in diameter, 98 inches long, tapered to 103 inches.

Normal Weight:
1st bar, 31 pounds, 1 ounce.
2nd " 14 pounds, 10 ounces.
3rd " 6 pounds, 15 "

Minimum Weight:
1st bar, 30 pounds, 2 ounces.
2nd " 14 pounds, 2 "
3rd " 6 pounds, 12 "

Outside diameters, 1st coil, 8 inches; 2nd coil, 5½ inches; 3rd coil, 3¾ inches.

1st single coil, heights, 9⅛ inches free; 5½ inches solid; 7 inches with 4,550 pounds.

Capacity, 7,750 pounds.

2nd single coil, heights, 9⅛ inches free; 5½ inches solid; 7 inches with 2,100 pounds.

Capacity, 3,600 pounds.

3rd single coil, heights, 9⅛ inches free; 5½ inches solid; 7 inches with 1,050 pounds.

Capacity, 1,800 pounds.

Cluster of springs, heights, 9⅛ inches free; 5½ inches solid; 7 inches with 7,700 pounds.

Capacity, 13,150 pounds.

Ordered in lots of 50. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 7.

(Formerly Class G.)

Shown on Tracing No. 9327.

Eight Bars:

4 bars, 15-16 inch in diameter 72½ inches long, tapered to 79 inches.

4 bars, 19-32 inch in diameter, 40½ inches long, tapered to 43 inches.

Normal weight of each of

1st four bars, 14 pounds, 3 ounces; minimum weight, 13 pounds, 12 ounces.

2nd four bars, 3 lbs, 2¾ ounces; minimum weight, 3 pounds, 1 ounce.

Outside diameter of first four coils, 5 3-16 inches; of 2nd four coils, 2 3-32 inches.

Caps of malleable iron or pressed steel, ⅛ inch thick.

1st single coil, heights, 6⅞ inches free; 5⅛ inches solid, 6 inches with 3,125 pounds.

Capacity, 6,500 pounds.

2nd single coil, heights, 5 11-16 inches free; 5⅛ inches solid; 5 5-16 inches with 2,530 pounds.

Capacity, 4,000 pounds.

Cluster of springs, heights, including caps, 7⅛ inches free; 5⅜ inches solid; 6¼ inches with 12,500 pounds; 5 27-32 inches with 21,000 pounds.

Capacity, 42,000 pounds.

Ordered in lots of 50. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 8.

(Formerly Class H.)

Shown on Tracing No. 9328.

One bar, 1 5-16 inches in diameter, 96 inches long, tapered to 106½ inches.

Normal weight, 36 pounds, 12 ounces; minimum weight, 35 pounds, 10 ounces.

Outside diameter of coil, 8 inches.

Height, 9⅛ inches free; 6 inches solid; 7¼ inches with 6,350 pounds.

Capacity, 10,600 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 9.

(Formerly Class I.)

Shown on Tracing No. 9329.

One bar, 1¼ inches in diameter, 97½ inches long, tapered to 108 inches.

Normal weight, 33 pounds, 12 ounces; minimum weight, 32 pounds, 12 ounces.

Outside diameter of coil, 8 inches.

Heights, 9 inches free; 5¾ inches solid; 7½ inches with 4,000 pounds.

Capacity, 9,100 pounds.

Ordered in lots of 50. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 10.

(Formerly Class J.)

Shown on tracing No. 9330.

One bar 1 inch in diameter, 85 inches long, tapered to 92 inches.

Normal weight, 18 pounds, 14 ounces; minimum weight, 18 pounds, 4 ounces.

Outside diameter of coil, $5\frac{1}{2}$ inches.

Heights, $8\frac{1}{2}$ inches free; 6 inches solid; 7 inches with 4,500 pounds.

Capacity, 7,000 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 11.

(Formerly Class K.)

Shown on tracing No. 9331.

One bar, $\frac{3}{4}$ inches in diameter, 89 inches long, tapered to 97 inches.

Normal weight, 11 pounds, 2 ounces; minimum weight, 10 pounds, 12 ounces.

Outside diameter of coil, $5\frac{3}{4}$ inches.

Heights, 8 inches free; $4\frac{1}{4}$ inches solid; $5\frac{3}{8}$ inches with 1,850 pounds.

Capacity, 2,650 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 12.

(Formerly Class L.)

Shown on tracing No. 9332.

Two Bars:

1st bar, $1\frac{3}{8}$ inches in diameter, 87 inches long, tapered to $97\frac{3}{8}$ inches.

2nd bar, $\frac{7}{8}$ inch in diameter, 85 inches long, tapered to $91\frac{1}{2}$ inches.

Normal weight, 1st bar, 36 pounds, 7 ounces; minimum weight, 35 pounds, 6 ounces.

Normal weight, 2nd bar, 14 pounds, 7 ounces; minimum weight, 14 pounds.

Outside diameters, 1st coil, 8 inches; 2nd coil, 5 inches.

1st single coil, heights, 8½ inches free; 5¾ inches solid; 7⅜ inches with 5,000 pounds.

Capacity, 12,200 pounds.

2nd single coil, heights, 8½ inches free; 5¾ inches solid; 7⅜ inches with 2,000 pounds.

Capacity, 5,200 pounds.

Cluster of springs, heights, 8½ inches free; 5¾ inches solid; 7⅜ inches with 7,000 pounds.

Capacity, 17,400 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 13.

(Not previously classified.)

Shown on tracing No. 9333.

Two bars:

1st bar, 1 3-16 inches in diameter, 99⅛ inches long, tapered to 109¾ inches.

2nd bar, 13-16 inch in diameter, 99⅛ inches long, tapered to 106½ inches.

Normal weight, 1st bar, 31 pounds, 1 ounce; minimum weight, 30 pounds, 2 ounces.

Normal weight, 2nd bar, 14 pounds, 10 ounces; minimum weight, 14 pounds, 2 ounces.

Outside diameter, 1st coil, 8 inches; 2nd coil, 5½ inches.

1st single coil, heights, 9⅛ inches free; 5½ inches solid; 7 inches with 4,550 pounds.

Capacity, 7,750 pounds.

2nd single coil, heights, 9⅛ inches free; 5½ inches solid; 7 inches with 2,100 pounds.

Capacity, 3,600 pounds.

Cluster of springs, heights, 9⅛ inches free; 5½ inches solid; 7 inches with 6,650 pounds.

Capacity, 11,350 pounds.

Ordered in lots of 50. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 14.

(Formerly Class N.)

Shown on tracing No. 9334.

Two bars:

1st bar, 1⅛ inches in diameter, 51 inches long, tapered to 58⅞ inches.

2nd bar, 11-16 inch in diameter, 51⅛ inches long, tapered to 56 inches.

Normal weight, 1st bar, 14 pounds, 4 ounces; minimum weight, 13 pounds, 14 ounces.

Normal weight, 2nd bar, 5 pounds, 6 ounces; minimum weight, 5 pounds, 3 ounces.

Outside diameters, 1st coil, 6⅛ inches; 2nd coil, 3¾ inches.

1st single coil, heights, 5⅛ inches free; 3 11-16 inches solid; 4 3-16 inches with 5,000 pounds.

Capacity, 8,950 pounds.

2nd single coil, heights, 5⅛ inches free; 3 11-16 inches solid; 4 3-16 inches with 2,000 pounds.

Capacity, 3,350 pounds.

Cluster of springs, heights, 5⅛ inches free; 3 11-16 inches solid; 4 3-16 inches with 7,000 pounds.

Capacity, 12,300 pounds.

Ordered in lots of 100. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 15.

(Formerly Class O.)

Shown on tracing No. 9335.

Two bars:

1st bar, 1 7-32 inches in diameter, 55½ inches long, tapered to 63¼ inches.

2nd bar, 11-16 inch in diameter, 55⅞ inches long, tapered to 59¾ inches.

Normal weight, 1st bar, 18 pounds, 5 ounces; minimum weight, 17 pounds, 12 ounces.

Normal weight, 2nd bar, 5 pounds, 14 ounces; minimum weight, 5 pounds, 11 ounces.

Outside diameter, 1st coil, 6 3-16 inches; 2nd coil, 3½ inches.

1st single coil, heights, 5¾ inches free; 4 5-16 inches solid; 5 3-16 inches with 4,600 pounds.

Capacity, 11,500 pounds.

2nd single coil, heights, 5¾ inches free; 4 5-16 inches solid; 5 3-16 inches with 1,400 pounds.

Capacity, 3,500 pounds.

Cluster of springs, heights, 5¾ inches free; 4 5-16 inches solid; 5 3-16 inches with 6,000 pounds.

Capacity, 15,000 pounds.

Ordered in lots of 100. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 16.
(Formerly Class P.)
Shown on tracing No. 9336.

One bar, 15-16 inch in diameter, 85 inches long, tapered to 92⅞ inches.

Normal weight, 16 pounds, 10 ounces; minimum weight, 16 pounds, 2 ounces.

Outside diameter of coil, 6 inches.

Heights, 8 inches free; 5 inches solid; 6 inches with 3,600 pounds.

Capacity, 5,100 pounds.

Ordered in lots of 50. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 17.
(Formerly Class Q.)
Shown on tracing No. 9337.

Two bars:

1st bar, 1 5-16 inches in diameter, 96 inches long, tapered to 106½ inches.

2nd bar, 13-16 inch in diameter, 100 inches long, tapered to 106¾ inches.

Normal weight, 1st bar, 36 pounds, 12 ounces; minimum weight, 35 pounds, 10 ounces.

Normal weight, 2nd bar, 14 pounds, 12 ounces; minimum weight, 14 pounds, 4 ounces.

Outside diameters, 1st coil, 8 inches; 2nd coil, 5⅛ inches.

1st single coil, heights, 9⅛ inches free; 6 inches solid; 7⅝ inches with 5,100 pounds.

Capacity, 10,800 pounds.

2nd single coil, heights, 9⅛ inches free; 6 inches solid; 7⅝ inches with 1,700 pounds.

Capacity, 3,700 pounds.

Cluster of springs, heights, 9⅛ inches free; 6 inches solid; 7⅝ inches with 6,800 pounds.

Capacity, 14,500 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 18.
(Formerly Class R.)
Shown on tracing No. 9338.

One bar, 11-64 inch in diameter, 75 inches long, tapered to 76¼ inches. Ends ground.

Normal weight, 8 ounces; minimum weight, 7¾ ounces.

Outside diameter of coil, 1 inch.

Heights, 8 inches free; 5 inches solid; 6 inches with 170 pounds.

Capacity, 270 pounds.

Ordered in lots of 50. Must conform to Sections 2, 3, 4, 8, 9 and 11.

CLASS H 19.

(Formerly Class S.)

Shown on tracing No. 9339.

One bar, 17-32 inch in diameter, 81½ inches long, tapered to 85½ inches.

Normal weight, 5 pounds, 2 ounces; minimum weight, 4 pounds, 15 ounces.

Outside diameter of coil, 3 1-32 inches.

Heights, 8 inches free; 5 9-16 inches solid; 6 7-16 inches with 1,200 pounds.

Capacity, 1,900 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 8, 9 and 11.

CLASS H 20.

(Formerly Class T.)

Shown on tracing No. 9340.

One bar, ¼ inch in diameter, 94⅞ inches long, tapered to 96⅝ inches. Ends ground.

Normal weight, 1 pound, 5 ounces; minimum weight, 1 pound, 4 ounces.

Outside diameter of coil, 1½ inches.

Heights, 9 inches free; 6 inches solid; 6¾ inches with 300 pounds.

Capacity, 400 pounds.

Ordered in lots of 100. Must conform to Sections 2, 3, 4, 8, 9 and 11.

CLASS H 21.

(Formerly Class U.)

Shown on tracing No. 9341.

Four bars, 15-16 inch in diameter, 56 inches long, tapered to 62⅜ inches.

Normal weight of each bar, 10 pounds, 15½ ounces; minimum weight, 10 pounds, 10¼ ounces.

Outside diameter of coils, 5 inches.

Caps of malleable iron or pressed steel.

Single coil, heights, $5\frac{5}{8}$ inches free; $4\frac{1}{8}$ inches solid; $4\frac{7}{8}$ inches with 3,190 pounds.

Capacity, 6,375 pounds.

Cluster of springs, heights, excluding caps, $5\frac{5}{8}$ inches free; $4\frac{1}{8}$ inches solid; $4\frac{7}{8}$ inches with 12,750 pounds.

Capacity, 25,500 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 22.
(Formerly Class V.)
Shown on tracing No. 9342.

Four bars, 1 1-16 inches in diameter, $51\frac{3}{4}$ inches long, tapered to $58\frac{3}{8}$ inches.

Normal weight of each bar, 13 pounds; minimum weight, 12 pounds, $9\frac{3}{4}$ ounces.

Outside diameter of coils, 5 5-16 inches.

Caps of malleable iron or pressed steel.

Single coil, heights, $5\frac{5}{8}$ inches free; $4\frac{1}{8}$ inches solid; 5 inches with 4,175 pounds.

Capacity, 10,500 pounds.

Cluster of springs, heights, excluding caps, $5\frac{5}{8}$ inches free; $4\frac{1}{8}$ inches solid; 5 inches with 16,700 pounds.

Capacity, 42,000 pounds.

Ordered in lots of 100. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 23.
(Formerly Class W.)
Shown on tracing No. 9343.

Four bars, 1 1-16 inches in diameter, 61 inches long, tapered to $67\frac{1}{2}$ inches.

Normal weight of each bar, 15 pounds, $5\frac{1}{4}$ ounces; minimum weight, 14 pounds, $13\frac{3}{4}$ ounces.

Outside diameter of coils, 5 5-16 inches.

Caps of malleable iron or pressed steel.

Single coil, heights, $6\frac{5}{8}$ inches free; $4\frac{7}{8}$ inches solid; 5 13-16 inches with 4,625 pounds.

Capacity, 10,500 pounds .

Cluster of springs, heights, excluding caps, $6\frac{5}{8}$ inches free; $4\frac{7}{8}$ inches solid; 5 13-16 inches with 18,500 pounds.

Capacity, 42,000 pounds.

Ordered in lots of 200. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 24.
(Formerly Class X.)
Shown on tracing No. 10,038.

Two bars:

1st bar, $1\frac{1}{4}$ inches in diameter, $75\frac{1}{4}$ inches long, tapered to $83\frac{1}{8}$ inches.

2nd bar, $\frac{3}{4}$ inch in diameter, $72\frac{1}{4}$ inches long, tapered to $76\frac{3}{4}$ inches.

Normal weight, 1st bar, 26 pounds, 2 ounces; minimum weight, 25 pounds, 5 ounces.

Normal weight, 2nd bar, 9 pounds; minimum weight, 8 pounds, 12 ounces.

Outside diameter, 1st coil, $6\frac{1}{4}$ inches; 2nd coil, $3\frac{5}{8}$ inches.

1st single coil, heights, 8 inches free; 6 inches solid; $7\frac{1}{4}$ inches with 5,000 pounds.

Capacity, 13,400 pounds.

2nd single coil, heights, 8 inches free; 6 inches solid; $7\frac{1}{4}$ inches with 2,000 pounds.

Capacity, 5,600 pounds.

Cluster of springs, heights, 8 inches free; 6 inches solid; $7\frac{1}{4}$ inches with 7,000 pounds.

Capacity, 19,000 pounds.

Ordered in lots of 200. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 25.
(Formerly Class Y.)
Shown on tracing No. 9345.

Two bars:

1st bar, $1\frac{1}{4}$ inches in diameter, $56\frac{1}{2}$ inches long, tapered to $64\frac{3}{8}$ inches.

2nd bar, $\frac{3}{4}$ inch in diameter, $54\frac{1}{4}$ inches long, tapered to $58\frac{3}{4}$ inches.

Normal weight, 1st bar, 19 pounds, 9 ounces; minimum weight, 19 pounds.

Normal weight, 2nd bar, 6 pounds, 12 ounces; minimum weight, 6 pounds, 9 ounces.

Outside diameter, 1st coil, $6\frac{1}{4}$ inches; 2nd coil, $3\frac{5}{8}$ inches.

1st single coil, heights, 6 inches free; $4\frac{1}{2}$ inches solid, $5\frac{3}{8}$ inches with 5,000 pounds.

Capacity, 12,000 pounds.

2nd single coil, heights, 6 inches free; $4\frac{1}{2}$ inches solid; $5\frac{3}{8}$ inches with 2,000 pounds.

Capacity, 5,000 pounds.

Cluster of springs, heights, 6 inches free; 4½ inches solid; 5⅜ inches with 7,000 pounds.

Capacity, 17,000 pounds.

Ordered in lots of 100. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 26.

(Formerly Class Z.)

Shown on Tracing No. 9346.

One bar, 9-64 inch in diameter, 57½ inches long, tapered to 59 inches. Ends ground.

Normal weight, 4 ounces; minimum weight, 3½ ounces.

Outside diameter of coil, 1 inch.

Heights, 5¾ inches free; 3 inches solid; 3¼ inches with 110 pounds.

Capacity, 130 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 8, 9 and 11.

CLASS H 27.

(Not previously classified.)

Shown on tracing No. 9347.

Two bars:

1st bar, 1¼ inches in diameter, 97½ inches long, tapered to 108 inches.

2nd bar, ½ inch in diameter, 90¾ inches long, tapered to 95⅛ inches.

Normal weight, 1st bar, 33 pounds, 12 ounces; minimum weight, 32 pounds, 12 ounces.

Normal weight, 2nd bar, 5 pounds; minimum weight, 4 pounds, 14 ounces.

Outside diameter, 1st coil, 8 inches; 2nd coil, 3¼ inches.

1st single coil, heights, 9 inches free; 5¾ inches solid; 7¼ inches with 4,850 pounds.

Capacity, 9,000 pounds.

2nd single coil, heights, 8½ inches free; 5¼ inches solid; 6¾ inches with 810 pounds.

Capacity, 1,500 pounds.

Cluster of springs complete, heights, 9 inches free; 5¾ inches solid; 7¼ inches with 5,660 pounds.

Capacity, 10,500 pounds.

Inner coil to have malleable iron caps, ¼ inch thick each.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 28.

(Not previously classified.)

Shown on tracing No. 9348.

Three bars:

1st bar, 1 13-32 inches in diameter, 84 11-16 inches long, tapered to 95 inches.

2nd bar, 57-64 inch in diameter, 84 11-16 inches long, tapered to 91¼ inches.

3rd bar, 35-64 inch in diameter, 84 11-16 inches long, tapered to 88¾ inches.

Normal weight, 1st bar, 37 pounds, 3 ounces; minimum weight, 36 pounds, 1 ounce.

Normal weight, 2nd bar, 14 pounds, 14 ounces; minimum weight, 14 pounds, 7 ounces.

Normal weight, 3rd bar, 5 pounds, 11 ounces; minimum weight, 5 pounds, 8 ounces.

Outside diameters, 1st coil, 8 inches; 2nd coil, 5 1-16 inches; 3rd coil, 3⅛ inches.

1st single coil, heights, 8¼ inches free; 5¾ inches solid; 6⅞ inches with 7,325 pounds.

Capacity, 13,250 pounds.

2nd single coil, heights, 8¼ inches free; 5¾ inches solid; 6⅞ inches with 2,925 pounds.

Capacity, 5,300 pounds.

3rd single coil, heights, 8¼ inches free; 5¾ inches solid; 6⅞ inches with 1,050 pounds.

Capacity, 2,000 pounds.

Cluster of springs, heights, 8¼ inches free; 5¾ inches solid; 6⅞ inches with 11,300 pounds.

Capacity, 20,550 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 29.

(Not previously classified.)

Shown on tracing No. 9349.

One bar, 7-32 inch in diameter, 20½ inches long, tapered tc 22 7-16 inches. Ends ground.

Normal weight, 4 ounces; minimum weight 3⅞ ounces.

Outside diameter of coil, 1 15-32 inches.

Heights, 1 11-16 inches free; 1 9-64 inches solid; 1⅜ inches with 110 pounds.

Capacity, 200 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 5, 8, 9 and 11.

CLASS H 30.
(Not previously classified.)
Shown on tracing No. 9349.

One bar, $\frac{1}{4}$ inch in diameter, $18\frac{1}{2}$ inches long, tapered to 20 7-16 inches. Ends ground.

Normal weight, 4 ounces; minimum weight, $3\frac{7}{8}$ ounces.

Outside diameter of coil, $1\frac{1}{2}$ inches.

Heights, $1\frac{5}{8}$ inches free; 1 11-64 inches solid; $1\frac{3}{8}$ inches with 167 pounds.

Capacity, 300 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 5, 8, 9 and 11.

CLASS H 31.
(Not previously classified.)
Shown on tracing No. 9350.

Two bars:

1st bar, 1 13-32 inches in diameter, 84 11-16 inches long, tapered to 95 inches.

2nd bar, 57-64 inches in diameter, 84-11-16 inches long, tapered to $91\frac{1}{4}$ inches.

Normal weight, 1st bar, 37 pounds, 3 ounces; minimum weight, 36 pounds.

Normal weight, 2nd bar, 14 pounds, 14 ounces; minimum weight, 14 pounds, 7 ounces.

Outside diameters, 1st coil, 8 inches; 2nd coil, 5 1-16 inches.

1st single coil, heights, $8\frac{1}{4}$ inches free; $5\frac{3}{4}$ inches solid; $6\frac{7}{8}$ inches with 7,325 pounds.

Capacity, 13,250 pounds.

2nd single coil, heights, $8\frac{1}{4}$ inches free; $5\frac{3}{4}$ inches solid; $6\frac{7}{8}$ inches with 2,925 pounds.

Capacity, 5,300 pounds.

Cluster of springs, heights, $8\frac{1}{4}$ inches free; $5\frac{3}{4}$ inches solid; $6\frac{7}{8}$ inches with 10,250 pounds.

Capacity, 18,550 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 32.
(Not previously classified.)
Shown on tracing No. 9351.

One bar, $1\frac{3}{8}$ inches in diameter, 87 inches long, tapered to $97\frac{3}{8}$ inches.

Normal weight, 36 pounds, 7 ounces; minimum weight, 35 pounds, 6 ounces.

Outside diameter of coil, 8 inches.

Heights, 8½ inches free; 5¾ inches solid; 6⅞ inches with 7,300 pounds.

Capacity, 12,330 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 33.

(Not previously classified.)

Shown on tracing No. 9359.

Three bars:

1st bar, 1 11-32 inches in diameter, 83⅝ inches long, tapered to 94⅛ inches.

2nd bar, ⅞ inch in diameter, 82 inches long, tapered to 88¾ inches.

3rd bar, 9-16 inch in diameter, 80¾ inches long, tapered to 84⅞ inches.

Normal weight, 1st bar, 33 pounds, 8 ounces; minimum weight, 32 pounds, 8 ounces.

Normal weight, 2nd bar, 13 pounds, 15 ounces; minimum weight, 13 pounds, 8 ounces.

Normal weight, 3rd bar, 5 pounds, 10½ ounces; minimum weight, 5 pounds, 7¾ ounces.

Outside diameter, 1st coil, 8 inches; 2nd coil, 5⅛ inches; 3rd coil, 3¼ inches.

1st single coil, heights, 8 inches free; 5⅜ inches solid; 6 13-16 inches with 5,050 pounds.

Capacity, 11,300 pounds.

2nd single coil, heights, 8 inches free; 5⅜ inches solid; 6 13-16 inches with 2,250 pounds.

Capacity, 5,000 pounds.

3rd single coil, heights, 8 inches free; 5⅜ inches solid; 6 13-16 inches with 1,000 pounds.

Capacity, 2,200 pounds.

Cluster of springs, heights, 8 inches free; 5⅜ inches solid; 6 13-16 inches with 8,300 pounds.

Capacity, 18,500 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 34.

(Not previously classified.)

Shown on tracing No. 9360.

Three bars:

1st bar, $1\frac{3}{8}$ inches in diameter, $83\frac{1}{4}$ inches long, tapered to $93\frac{5}{8}$ inches.

2nd bar, $\frac{7}{8}$ inch in diameter, $83\frac{1}{4}$ inches long, tapered to 90 inches.

3rd bar, 9-16 inch in diameter, $80\frac{5}{8}$ inches long, tapered to $84\frac{3}{4}$ inches.

Normal weight, 1st bar, 34 pounds, $14\frac{1}{2}$ ounces; minimum weight 33 pounds, 13 ounces.

Normal weight, 2nd bar, 14 pounds, 2 ounces; minimum weight, 13 pounds, $11\frac{1}{2}$ ounces.

Normal weight, 3rd bar, 5 pounds, $10\frac{1}{2}$ ounces; minimum weight, 5 pounds, $7\frac{3}{4}$ ounces.

Outside diameters, 1st coil, 8 inches; 2nd coil, 5 3-32 inches; 3rd coil, 3 3-16 inches.

1st single coil, heights, 8 inches free; $5\frac{1}{2}$ inches solid; $6\frac{3}{4}$ inches with 6,100 pounds.

Capacity, 12,300 pounds.

2nd single coil, heights, 8 inches free; $5\frac{1}{2}$ inches solid; $6\frac{3}{4}$ inches with 2,450 pounds.

Capacity, 4,900 pounds.

3rd single coil, heights, 8 inches free; $5\frac{1}{2}$ inches solid; $6\frac{3}{4}$ inches with 1,100 pounds.

Capacity, 2,300 pounds.

Cluster of springs, heights, 8 inches free; $5\frac{1}{2}$ inches solid; $6\frac{3}{4}$ inches with 9,650 pounds.

Capacity, 19,500 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 35.

(New.)

Shown on tracing No. 9397.

One bar, $\frac{5}{8}$ inch in diameter, $53\frac{1}{8}$ inches long, tapered to $56\frac{7}{8}$ inches.

Normal weight, 4 pounds, 10 ounces; minimum weight, 4 pounds, 7 ounces.

Outside diameter of coil, 3 inches.

Heights, 5¾ inches free; 4 7-16 inches solid; 5 inches with 1,885 pounds.

Capacity, 3,320 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 36.

(Not previously classified.)

Shown on tracing No. 9554.

One bar, 5-16 inch square, 31 inches long, tapered to 34½ inches. Ends ground.

Normal weight, 14 ounces; minimum weight, 13½ ounces.

Outside diameter of coil, 2½ inches.

Heights, 2⅜ inches free; 1 7-16 inches solid; 1¾ inches with 380 pounds.

Capacity, 530 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 5, 6, 8, 9 and 11.

CLASS H 37.

(New.)

Shown on tracing No. 9641.

Four bars, 27-32 inch in diameter, 77 inches long, tapered to 81⅞ inches.

Normal weight of each bar, 12 pounds, 2½ ounces; minimum weight, 11 pounds, 12½ ounces.

Outside diameter of coils, 3 15-16 inches.

Heights, 8½ inches free; 6 11-16 inches solid; 7½ inches with 3,300 pounds.

Capacity of each coil, 6,250 pounds. Total capacity, 25,000 pounds.

Ordered in lots of 200. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 38.

(New.)

Shown on tracing No. 9642.

Four bars, ¾ inch in diameter, 67½ inches long, tapered to 72¼ inches.

Normal weight of each bar, 8 pounds, 7 ounces; minimum weight, 8 pounds, 2½ ounces.

Outside diameter of coils, 3¾ inches.

Heights, 7 1-16 inches free; 5⅜ inches solid; 6¼ inches with 2,200 pounds.

Capacity of each coil, 4,420 pounds. Total capacity, 17,680 pounds.

Ordered in lots of 50. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 39.

(New.)

Shown on tracing No. 9644.

Two bars:

1st bar, 1⅜ inches in diameter, 75⅝ inches long, tapered to 83½ inches.

2nd bar, ¾ inch in diameter, 76¼ inches long, tapered to 80⅝ inches.

Normal weight, 1st bar, 31 pounds, 11 ounces; minimum weight, 30 pounds, 12 ounces.

Normal weight, 2nd bar, 9 pounds, 8 ounces; minimum weight, 9 pounds, 4 ounces.

Outside diameter of 1st coil, 6⅜ inches; 2nd coil, 3½ inches.

1st single coil heights, 8⅜ inches free; 6⅝ inches solid; 7½ inches with 8,150 pounds.

Capacity, 16,300 pounds.

2nd single coil, heights, 8⅜ inches free; 6⅝ inches solid; 7½ inches with 2,350 pounds.

Capacity, 4,700 pounds .

Cluster of springs, heights, 8⅜ inches free; 6⅝ inches solid; 7½ inches with 10,500 pounds.

Capacity, 21,000 pounds.

Ordered in lots of 200. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 40.

(New.)

Shown on tracing No. 9649.

One bar, ¾ inch in diameter, 177½ inches long, tapered to 186⅝ inches.

Normal weight, 22 pounds, 2½ ounces; minimum weight, 21 pounds, 7¾ ounces.

Outside diameter of coil, 6½ inches.

Height, 16 inches free; 7⅜ inches solid; 8⅞ inches with 1,900 pounds.

Capacity, 2,300 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 41.

(New.)

Shown on tracing No. 9698.

One bar, 11-16 inch in diameter, 117½ inches long, tapered to 123½ inches.

Normal weight, 12 pounds, 10 ounces; minimum weight, 11 pounds, 15 ounces.

Outside diameter of coil, 4½ inches.

Heights, 10⅞ inches free; 6¾ inches solid; 8⅝ inches with 1,500 pounds.

Capacity, 2,720 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 42.

(New.)

Shown on tracing No. 9735.

Two bars:

1st bar, 1 inch in diameter, 36 inches long, tapered to 42⅞ inches.

2nd bar, 19-32 inch in diameter, 36 inches long; tapered to 40 inches.

Normal weight, 1st bar, 8 pounds; minimum weight, 7 pounds, 10½ ounces.

Normal weight, 2nd bar, 2 pounds, 13 ounces; minimum weight, 2 pounds, 11½ ounces.

Outside diameter of 1st coil, 5⅜ inches; 2nd coil 3 3-16 inches.

1st single coil, heights, 3⅝ inches free; 2⅝ inches solid; 3⅜ inches with 1,795 pounds.

Capacity, 7,180 pounds.

2nd single coil, heights, 3⅝ inches free; 2⅝ inches solid; 3⅜ inches with 635 pounds.

Capacity, 2,540 pounds.

Cluster of springs, heights, 3⅝ inches free; 2⅝ inches solid; 3⅜ inches with 2,430 pounds.

Capacity, 9,720 pounds.

Ordered in lots of 100. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 43.

(New.)

Shown on tracing No. 9756.

One bar, 7-16 inch in diameter, 96 inches long, tapered to 102 5-16 inches.

Normal weight, 4 pounds, 1 ounce; minimum weight, 3 pounds, 13 ounces.

Outside diameter of coil, 4 7-16 inches.

Heights, 8 15-16 inches free; $3\frac{3}{8}$ inches solid; $5\frac{1}{8}$ inches with 450 pounds.

Capacity, 660 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 44.

(New.)

Shown on tracing No. 9901.

One bar, $\frac{1}{4}$ inch in diameter, $21\frac{1}{2}$ inches long, tapered to $23\frac{3}{4}$ inches. Ends ground.

Normal weight, $4\frac{3}{4}$ ounces; minimum weight, $4\frac{1}{2}$ ounces.

Outside diameter of coil, 1 11-16 inches.

Heights, $1\frac{1}{8}$ inches free; 1 13-64 inches solid; 1 7-16 inches with 209 pounds.

Capacity, 340 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 5, 7, 8, 9 and 11.

CLASS H 45.

(New.)

Shown on tracing No. 9942.

One bar, $\frac{1}{4}$ inch in diameter, $78\frac{1}{2}$ inches long, tapered to $80\frac{1}{2}$ inches. Ends ground.

Normal weight, 1 pound, $1\frac{1}{2}$ ounces; minimum weight, 1 pound, 1 ounce.

Outside diameter of coil, $1\frac{1}{2}$ inches.

Heights, $7\frac{1}{2}$ inches free; 5 inches solid; 6 inches with 235 pounds.

Capacity, 400 pounds.

Ordered in lots of 50. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 46.
(New.)
Shown on tracing No. 9943.

One bar, $\frac{1}{4}$ inch in diameter, 53 inches long, tapered to $54\frac{3}{4}$ inches. Ends ground.

Normal weight, 12 ounces; minimum weight, $11\frac{1}{2}$ ounces.

Outside diameter of coil, $1\frac{3}{8}$ inches.

Heights, $5\frac{1}{8}$ inches free; $3\frac{3}{4}$ inches solid; $4\frac{1}{2}$ inches with 240 pounds.

Capacity, 440 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 47.
(New.)
Shown on tracing No. 10509.

Four bars, 1 3-16 inches in diameter, $73\frac{1}{2}$ inches long, tapered to $79\frac{1}{2}$ inches.

Normal weight of each bar, 23 pounds; minimum weight, 22 pounds, 5 ounces.

Outside diameter of coils, 5 7-16 inches.

Caps of malleable iron or pressed steel.

Single coil, heights, $8\frac{1}{4}$ inches free; 6 9-16 inches solid; $7\frac{1}{4}$ inches with 7,400 pounds.

Capacity, 12,500 pounds.

Cluster of springs, heights, excluding caps, $8\frac{1}{4}$ inches free; 6 9-16 inches solid; $7\frac{1}{4}$ inches with 29,600 pounds.

Capacity, 50,000 pounds.

Ordered in lots of 100. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 48.
(New.)
Shown on tracing No. 10696.

One bar, $\frac{1}{2}$ inch in diameter, 77 inches long, tapered to $82\frac{1}{2}$ inches.

Normal weight, 4 pounds, $4\frac{1}{2}$ ounces; minimum weight, 4 pounds, $2\frac{1}{2}$ ounces.

Outside diameter of coil, 4 inches.

Heights, $5\frac{3}{4}$ inches free; $3\frac{1}{2}$ inches solid; $4\frac{1}{2}$ inches with 410 pounds.

Capacity, 740 pounds.

Ordered in lots of 100. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 49.

(New.)

Shown on tracing No. 10897.

Three bars:

1st bar, 1 11-32 inches in diameter, 103⅛ inches long, tapered to 113⅝ inches.

2nd bar, ⅞ inch in diameter, 101⅛ inches long, tapered to 107 13-16 inches.

3rd bar, 9-16 inch in diameter, 99½ inches long, tapered to 103 ⅝ inches.

Normal weight, 1st bar, 41 pounds, 5 ounces; minimum weight, 40 pounds, 1 ounce.

Normal weight, 2nd bar, 17 pounds, 3 ounces; minimum weight, 16 pounds, 10 ounces.

Normal weight, 3rd bar, 7 pounds; minimum weight, 6 pounds, 12 ounces.

Outside diameters, 1st coil, 8 inches; 2nd coil, 5⅛ inches; 3rd coil, 3¼ inches.

1st single coil, heights, 9⅞ inches free; 6⅝ inches solid; 8 inches with 6,600 pounds.

Capacity, 11,450 pounds.

2nd single coil, heights, 9⅞ inches free; 6⅝ inches solid; 8 inches with 2,950 pounds.

Capacity, 4,950 pounds.

3rd single coil, heights, 9⅞ inches free; 6⅝ inches solid; 8 inches with 1,250 pounds.

Capacity, 2,100 pounds.

Cluster of springs, heights, 9⅞ inches free; 6⅝ inches solid; 8 inches with 10,800 pounds.

Capacity, 18,500 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 50.

(New.)

Shown on tracing No. 10898.

Two bars:

1st bar, 1 11-32 inches in diameter, 103⅛ inches long; tapered to 113⅝ inches.

2nd bar, ⅞ inch in diameter, 101⅛ inches long, tapered to 107 13-16 inches.

Normal weight, 1st bar, 41 pounds, 5 ounces; minimum weight, 40 pounds, 1 ounce.

Normal weight, 2nd bar, 17 pounds, 3 ounces; minimum weight, 16 pounds, 10 ounces.

Outside diameters, 1st coil, 8 inches; 2nd coil, $5\frac{1}{8}$ inches.

1st single coil, heights, $9\frac{7}{8}$ inches free; $6\frac{5}{8}$ inches solid; 8 inches with 6,600 pounds.

Capacity, 11,450 pounds.

2nd single coil, heights, $9\frac{7}{8}$ inches free; $6\frac{5}{8}$ inches solid; 8 inches with 2,950 pounds.

Capacity, 4,950 pounds.

Cluster of springs, heights, $9\frac{7}{8}$ inches free; $6\frac{5}{8}$ inches solid; 8 inches with 9,550 pounds.

Capacity, 16,400 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 7, 8, 9 and 11.

CLASS H 51.

(Not previously classified.)

Shown on tracing No. 11127.

One bar, $\frac{1}{4}$ inch in diameter, $274\frac{7}{8}$ inches long, tapered to $276\frac{7}{8}$ inches. Ends ground.

Normal weight, 3 pounds, 7 ounces; minimum weight, 3 pounds, 5 ounces.

Outside diameter of coil, $1\frac{1}{2}$ inches.

Heights, 26 inches free; $17\frac{1}{2}$ inches solid; $19\frac{1}{2}$ inches with 300 pounds.

Capacity, 400 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 52.

(New.)

Shown on tracing No. 11155.

One bar, 9-16 inch in diameter, 162 inches long, tapered to $166\frac{3}{4}$ inches.

Normal weight, 11 pounds, 6 ounces; minimum weight, 11 pounds.

Heights, $15\frac{1}{4}$ inches free; 9 13-16 inches solid; $12\frac{3}{8}$ inches with 1,000 pounds.

Capacity, 1,900 pounds.

Ordered in lots of 100. Must conform to Sections, 2, 3, 4, 6, 8, 9 and 11.

CLASS H 53.

(New.)

Shown on tracing No. 11254.

Two bars:

1st bar, 11-16 inch in diameter, 185 7-16 inches long, tapered to 190⅝ inches.

2nd bar, 15-32 inch in diameter, 169 5-16 inches long, tapered to 172 9-16 inches.

Normal weight, 1st bar, 19 pounds, 7 ounces; minimum weight, 18 pounds, 13½ ounces.

Normal weight, 2nd bar, 8 pounds, 4 ounces; minimum weight, 8 pounds.

Outside diameters, 1st coil, 4 inches; 2nd coil, 2 17-32 inches.

1st single coil, heights, 18 inches free; 12¼ inches solid; 15½ inches with 1,360 pounds.

Capacity, 3,125 pounds.

2nd single coil, heights, 16½ inches free; 12½ inches solid; 15½ inches with 330 pounds.

Capacity, 1,410 pounds.

Cluster of springs, heights, 18 and 16½ inches free; 12¼ inches solid; 15½ inches with 1,690 pounds.

Capacity, 4,535 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 54.

(New.)

Shown on tracing No. 11255.

One bar, ¾ inch in diameter, 145½ inches long, tapered to 149¾ inches.

Normal weight, 18 pounds, 2½ ounces; minimum weight, 17 pounds, 9½ ounces.

Outside diameter of coil, 3½ inches.

Heights, 16 inches free; 12⅝ inches solid; 15¼ inches with 1,070 pounds.

Capacity, 4,800 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 55.

(New.)

Shown on tracing No. 11256.

One bar, 3-16 inch in diameter, 45⅛ inches long, tapered to 46 5-16 inches. Ends ground.

Normal weight, 5⅝ ounces; minimum weight, 5⅜ ounces.

Outside diameter of coil, 1 inch.

Heights, 4½ inches free; 3 5-16 inches solid; 4 inches with 103 pounds.

Capacity, 245 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 56.

(New.)

Shown on tracing No. 11595.

Two bars:

1st bar, 1 3-16 inches in diameter, 87½ inches long, tapered to 94 11-16 inches.

2nd bar, ⅝ inches in diameter, 95⅝ inches long, tapered to 99¾ inches.

Normal weight, 1st bar, 27 pounds, 6 ounces; minimum weight, 26 pounds, 9 ounces.

Normal weight, 2nd bar, 8 pounds, 4½ ounces; minimum weight, 8 pounds, ½ ounce.

Outside diameters, 1st coil, 5¾ inches; 2nd coil, 3¼ inches.

1st single coil, heights, 9½ inches free; 7¼ inches solid; 9¼ inches with 1,280 pounds.

Capacity, 11,530 pounds.

2nd single coil, heights, 9½ inches free; 7¼ inches solid; 9¼ inches with 270 pounds.

Capacity, 2,440 pounds.

Cluster of springs, heights, 9½ inches free; 7¼ inches solid; 9¼ inches with 6,110 pounds.

Capacity, 13,970 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

CLASS H 57.

(New.)

Shown on tracing No. 11676.

One bar, $\frac{5}{8}$ inch in diameter, 150 inches long, tapered to $154\frac{1}{8}$ inches.

Normal weight, 13 pounds; minimum weight 12 pounds, 9 ounces.

Outside diameter of coil, $3\frac{1}{4}$ inches.

Heights, $15\frac{3}{8}$ inches free; $11\frac{3}{8}$ inches solid; $13\frac{1}{4}$ inches with 1,500 pounds.

Capacity, 2,922 pounds.

Ordered in lots as the demands of the service indicate. Must conform to Sections 2, 3, 4, 6, 8, 9 and 11.

Dated:
Office of the General Supt. Motive Power,
Altoona, Pa., September 18th, 1895.

SPECIFICATIONS FOR WASTE.

No. 77.

Waste of three kinds will be bought as the needs of the service may require, viz:

1st, Standard Wool Waste.
2nd, Standard Cotton Waste.
3rd, White Cotton Waste.

These grades of waste will be purchased in the following manner: About the 20th of each month parties desiring to furnish waste for the next month's supply must send to the undersigned at Altoona, a sample of about half a pound of such waste as they desire to furnish, and at the same time send to the purchasing agent at Philadelphia a quotation for the same. The samples being received, will be examined and tested in accordance with the detailed specifications below, and no orders will be placed on samples that are unsatisfactory. All samples reaching Altoona later than the 28th of the month will be excluded from consideration. After the shipments are received at the various shops, a sample from any bale

at random will be sent to Altoona and compared with the sample on which the purchase was made. If the sample from shipment is inferior in any sense to the sample on which purchase was made, the whole shipment will be rejected and the shipper must pay the return freight.

STANDARD WOOL WASTE.

The material desired under this specification is all wool carpet yarn, in threads not less than three inches long, and free from moisture.

Orders will not be placed and shipments will not be accepted if the samples—

1st. Contain any other fibre than wool.
2nd. If they contain sweepings, flyings or dirt.
3rd. If they are not well machined.
4th. If they contain any material which is not new, or which gives any evidence of being soiled, or having been once used and afterwards washed or cleaned.

If the wrappings, including the hoops, exceed six per cent. of the gross weight of the bale, or if the moisture exceeds one per cent. of the net weight of the material, such excess will be deducted from the face of the bill at the same price per pound that is paid for the waste.

STANDARD COTTON WASTE.

The material desired under this specification is a mixture of equal parts by weight of white and colored new cotton threads properly mixed together, well machined, free from moisture, and containing no threads less than three inches long.

Orders will not be placed and shipments will not be accepted if the samples—

1st. Contain any other fibre than cotton, or more than fifty per cent. by weight of colored threads.
2nd. If they contain sweepings, flyings or dirt.
3rd. If they are not well machined.
4th. If they contain any material which is not new, or which gives any evidence of being soiled, or of having been once used and afterwards washed or cleaned.

If the wrappings, including the hoops, exceed five per cent. of the gross weight of the bale, or if the moisture exceeds one per cent. of the net weight of the material, such excess will be deducted from the face of the bill at the same price per pound that is paid for the waste.

WHITE COTTON WASTE.

The material desired under this specification is all new white cotton threads, not less than three inches long, well machined and free from moisture.

Orders will not be placed and shipments will not be accepted if the samples—

1st. Contain any colored threads, or any other fibre than cotton.

2nd. If they contain sweepings, flyings or dirt.

3rd. If they are not well machined.

4th. If they contain any material which is not new, or which gives any evidence of being soiled, or of having been once used and afterwards washed or cleaned.

If the wrappings, including the hoops, exceed five per cent. of the gross weight of the bale, or if the moisture exceeds one per cent. of the net weight of the material, such excess will be deducted from the face of the bill at the same price per pound that is paid for the waste.

Dated:

Office of the General Supt. Motive Power,
Altoona, Pa., April 20, 1894.

SPECIFICATIONS FOR CHAINS.

Superseding specifications dated February 14th, 1891
No. 11 A.

All chain will be ordered subject to inspection and test by the Company's Inspectors before shipment. Manufacturers filling orders will, when they have a shipment of chain ready, so advise the General Superintendent of Motive Power. They will be required to furnish suitable testing machines, and such

assistance as will enable the Inspectors to properly determine whether the chain meets the requirements, and must be prepared to ship in the presence of the Inspectors.

All chain will be proof tested to the strains shown in the table below, which it must stand without deformation, and in addition one short length of not less than two (2) feet for each two hundred (200) feet presented, shall be tested to destruction, and the two hundred (200) feet will be rejected if the test length falls below the figures given for breaking weight and elongation. On orders calling for less than two hundred (200) feet, one length shall be tested to destruction. When chain is ordered in lengths as used on the car, complete with long links, etc., welded on, the long links, hooks and eye bolts must be included in the proof test, such lengths may be chained together by temporary shackles during the test. One per cent. of the chain thus presented for test must be cut off at the long links and then measured and weighed to determine the weight per foot. The long links so cut must be replaced in the presence of the Inspector before shipment.

All chain must be smooth, free from the appearance of burnt welds, cracks or overlaps, and must have a workmanlike finish. Any chain defective in these respects will be rejected. Chain must not be less than the nominal size in the body or welds. Any chain found defective after shipment, will be returned without freight charges. Chain weighing in excess of the limits of weight shown in the table below, will be paid for at that weight.

The Company's drawing of "Standard Chains" No. 7677 will form part of these specifications. This drawing gives the desired dimensions, and if the length of 100 links in any of the crane chains is greater than shown, by as much as one per cent., the same will be rejected. In the case of 5-32 inch lock chain, and 3-16 inch fire door chain, as much as ten per cent. excess length of link will be allowed. For the remaining chains this limit will be two per cent. To determine the length, a piece of chain containing one hundred links whenever practicable will be selected, and the distance from inside end to inside end of end links measured, this measurement will be taken while the chain is in the test machine for proof test, with not more than ten (10) per cent. of the proof load on to take up the slack.

CHAIN—(Continued.)

The Main Requirements of the Specifications are Given in the Following Table.

No. on Drawing.	Nominal Diameter of Wire—Inches.	Description.	Maximum Length of 100 Links—Inches.	Weight Per Foot—Lbs.	Proof Test—Lbs.	Breaking Weight—Lbs.	Elongation—Per Cent.
1	5-32	Lock chain	103.1	0.20	.....	.....	..
2	3-16	Fire door chain	103.1	0.35	.....	.....	..
3	1-4	Crossing gate chain	102.0	0.70	1,500	3,000	10
4	5-16	Sprocket wheel chain	114.7	1.10	3,000	5,500	10
5	3-8	Brake chain	114.7	1.50	3,500	7,000	10
6	3-8	Crane chain	113.6	1.50	4,000	7,500	10
7	7-16	Drop bot. branch ch'n	127.5	1.90	5,000	9,500	10
8	7-16	Crane chain	126.3	1.90	5,500	10,000	10
9	1-2	Drop bot'm main ch'n	153.0	2.50	7,000	12,500	10
10	1-2	Crane chain	138.9	2.50	7,500	13,000	10
11	5-8	Safety chain	178.5	4.00	11,000	20,000	10
12	5-8	Crane chain	176.7	4.00	11,000	20,000	10
13	3-4	Log chain	204.0	5.50	16,000	29,000	10
14	3-4	Crane chain	202.0	5.50	16,000	29,000	10
15	7-8	Crane chain	252.5	7.40	22,000	40,000	10
16	1	Crane chain	277.7	9.50	30,000	55,000	10
17	1 1-8	Crane chain	303.0	12.00	40,000	66,000	10
18	1 1-4	Crane chain	353.5	15.00	50,000	82,000	10
19	1 1-2	Crane chain	416.3	21.00	70,000	116,000	10

Dated:
Office of Gen'l Supt. Motive Power,
Altoona, Pa., April 21st, 1896.

SPECIFICATIONS FOR FREIGHT CAR COLOR.

Superseding Specifications for Freight Car Color, dated November 9th, 1888.

No. 31.

Freight car color will be bought in the paste form, and the paste must contain nothing but oil, pigment and moisture.

Proportions of oil, pigment and moisture must be as nearly as possible as follows:

Pigment	74	per cent. by weight.
Oil	25	per cent. by weight.
Moisture	1	per cent. by weight.

The oil must be pure raw linseed oil, well clarified by settling and age.

The pigment desired, if it contains sulphate of lime or gypsum, should have this fully hydrated. It may have as inert material sulphate of lime or gypsum fully hydrated, silica, kaolin, soapstone or asbestine, or mixtures of any of these, sulphate of lime and silica preferred. The pigment should have the following composition:

Sesquioxide of Iron ...	25	per cent. by weight.
Inert Material	70	per cent. by weight.
Carbonate of Lime ...	5	per cent. by weight.

Samples of standard pigment showing shade will be furnished and shipments will be required to conform strictly to standard. The shade of paint being affected by the grinding, the P. R. R. standard shade is that given by the dry sample sent, mixed with the proper amount of oil, and ground, or better rubbed up in a small mortar with pestle until the paste will pass P. R. R. test for fine grinding. It is best to use fresh samples of the dry pigment for each day's testing. The comparison should always be made with the fresh material and never with the paint after it has become dry. The comparison is easiest made by putting a small hillock of the standard

paste and of that to be compared near each other on glass, and then laying a thin piece of glass as a cover on the two hillocks and pressing them together until the two samples unite. The line where the two samples unite is clearly marked, if they are not of the same shade. It is recommended to use for the cover the thin glass commonly employed by microscopist since this thin glass does not change the shade perceptibly.

The paste must be so finely ground that when a sample of it is mixed with half its weight of pure raw linseed oil and a small amount of the mixture placed on a piece of dry glass, and the glass placed vertical, there will be no separation of the oil from the pigment for at least half an hour. The temperature affects this test and it should always be made at 70 degrees Fahrenheit. The sample under test runs down the glass in a narrow stream when it is placed vertical, and it is sufficient if the oil and pigment do not separate for an inch down from the top of the test.

Shipments will not be accepted which

I. Contain less than 23 per cent. or more than 27 per cent. of oil.

II. Contain more than 2 per cent. volatile matter, including the moisture; the oil being dried at 250 degrees Fahrenheit, and the pigment dried in air not saturated with moisture at from 60 to 90 degrees Fahrenheit.

III. Contain impure or boiled linseed oil.

IV. Contain in the pigment sulphate of lime not fully hydrated, less than 20 per cent. of sesquioxide of iron, less than 2 per cent. or more than 5 per cent. of carbonate of lime, or have present any barytes, analine colors, lakes or any other organic coloring matter, or any caustic substances.

V. Vary from shade.

VI. Are not ground finely enough.

VII. Are a liver or so stiff when received that they will not readily mix for spreading.

Dated:

Office of the General Supt. Motive Power,
Altoona, Pa., May 23rd, 1893.

SPECIFICATIONS FOR WOOD PRESERVATIVE.

No. 35.

The material desired under this specification, is a product of the distillation of Georgia Pine, containing as large an amount as possible of the preservative acids characteristic of this distillate.

When a shipment is received a sample will be taken from one barrel at random, which sample will represent the shipment, and if this sample fails to meet the requirements below, the whole shipment will be returned.

The material desired shows the following figures on test:

Flashing point	200 deg.	Fahrenheit.
Burning point	220 deg.	"
Specific gravity	1.05 deg.	"

Temperature at which material will run 15 deg. Fahrenheit:

Tarry Matter	5.00	per cent.
Tar Acids	45.00	" "
Neutral Oils	50.00	" "

Material will not be accepted which flashes below 172 degrees Fahrenheit, burns below 200 degrees Fahrenheit, has a gravity less than 1.03, will not run at 20 degrees Fahrenheit, has more than 12.00 per cent. of tar, or less than 30 per cent. of tar acids.

Dated:

Office of the General Supt. Motive Power,
Altoona, Pa., June 26th, 1895.

INSTRUCTIONS IN REGARD TO USE OF WOOD PRESERVATIVE.

No. 88.

From this date Wood Preservative will be used as follows:

I. On all tenons and in all mortises in both passenger and freight car work, and in the wood work of tenders and cabs, except as specified in Sections V and VI. The skeletons of passenger equipment cars should be coated with wood preservative instead of with freight car color as formerly, except where glue is used in making joints. The backs of panels should be coated with freight car color. If the piece of wood is small, it is well to dip the tenon in the liquid. In all other cases it should be applied with a brush, and care should be taken to have as much of the wood preservative taken up by the wood as possible. The shoulders of the tenons and the shoulder seat should be included in the treatment, as it is found that the water, which gets in between the shoulders and shoulder seats, causes rapid decay in these places.

II. In all passenger, freight, tender and cab work, where two pieces of wood touch each other, and glue is not used in making joints, at least one good coat of wood preservative must be interposed, except in the joints of the siding and roofing, and except as specified in Sections V and VI; the roofs of cabs must have at least two coats before the tin is put on.

III. The floors, and tops of all stringers and end sills of all stock, gondola and flat cars and of cars engaged in the manure trade, and the skeletons of all tenders before the floor is laid, and all that part of the tender floor which is covered by the cistern, must have at least two good coats of wood preservative. It is also recommended to use wood preservative on tenons and in mortises of shop buildings and all over floor timbers and on underside of flooring, especially where the ground is damp and ventilation poor.

IV. On the floating equipment, wood preservative should be used freely. All parts of the hull which are submerged should have at least one good coat, and it should be used on tenons and in joints everywhere, where it will not interfere

with the paint as described below. The decks of ferry boats under the sheathing, and the sheathing itself, should have not less than two coats.

V. On wood that has been treated with wood preservative, it is found that paint dries very slowly, and great care should be taken not to use it or permit it to get on surfaces that must be painted.

VI. In those situations where from the construction employed or from the protection afforded by the paint, water cannot get at the wood work, wood preservative need not be used as above directed, but being a preservative it is better to use it where it is not actually needed, than to allow any part that does need it to escape.

VII. If the wood preservative, when received, is too thick for use, as may happen in cold weather, it may be thinned with spirits of turpentine.

Dated:

Office Superintendent Motive Power,
Fort Wayne, May 22nd, 1893.

APPENDIX

INCLUDING

BLANK FORMS FOR COMPLETE DETAILED BILLS OF MATERIALS.

Bill of Material in one.....**for**.....

Lot..... .....

....., ...,

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.		Rough Size.		B. M.
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....

Bill of Material in one.....for.....

Lot..... .....

....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...
...	.....	.....	.....	...	...

Bill of Material in one ..... **for**.....

Lot..... .....

....

WROUGHT IRON.

C. W.	W. W.	Nuts	Pcs.	Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

C. W.	W. W.	Nuts	Pcs.	Description	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one.....for.....

Lot..... .....

....., ...

Per Car.	MISCELLANEOUS.	Per Lot.	
.....	.....	....	.....
.....	.....	....	.....
.....	.....	....	.....

THE.....

ESTIMATED COST.....

For account of .....

SPECIFICATION.	Pr	Brakes	Brake Beams				Remarks
		Amount	Quantity	Amount	Quantity	Amount	
Lumber							
Castings—Gray							
" Malleable							
" Steel							
Wrought Iron							
Scrap							
Metals							
Nuts—Square							
" Hexagon							
Wrought Washers							
Nails							
Wheels							
Axles							
Journal Bearings							
Springs—Equalizers							
" Elliptic							
" Bolsters							
General Merchandise							
Turnbuckles							
Screws							
Chain							
Waste							
Oil							
Channels							
Dust-guards							
Journal Box Lids							
Brake Beams							
Paint Materials							
Freight—Express							
Labor: Lumber Yard							
Mill							
Blacksmith							
Bolt Room							
Iron Machine							
F'tt'g Wh'ls & Axles							
Truck Builder							
Painter							
Gen'l Labor							
" Expense							
Royalties							
Recapitulation:							
Materials							
Labor							
General Expense							
Royalties							
Patterns ..... Temp.							
Formers ..... Dies.							
Delivery							

Bill of Material in one.....**for**.....

Lot... ....

....., ...,

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.		Rough Size.		B. M.
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....

Bill of Material in one.....**for**.....

Lot.....

.....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

C. W.	W. W.	Nuts	Pcs.	Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.	C. W.	W. W.	Nuts.	Pcs.

Bill of Material in one ..... **for** .....

Lot..... .....

....

WROUGHT IRON.

Weight.	Size of Blank.	Finished Size.	Smith.	Bolt.	Iron Mac'h.	Description.	Tcs.	Nuts.	W. W.	C. W.

Bill of Material in one.....for.....

Lot..... .....

....., ...

Per Car.	MISCELLANEOUS.	Per Lot.	

THE .....

ESTIMATE t of .....

SPECIFICATIO	ly Brakes		Roof		Door		Remarks
	ity	Amount	Quantity	Amount	Quantity	Amount	
Lumber							
Kiln Drying							
Castings—Gray							
" Malle							
" Steel							
" Brass							
Wrought Iron							
Metals							
Nuts—Square							
" Hexagon							
Wrought Washe							
Nails							
Screws							
Springs							
General Merchan							
Roof							
Couplers							
Turnbuckles							
Doors							
Grain Doors							
Brakes							
Pipes and Fittin							
Brake Beams							
Paint Materials							
Paper							
Hair Felt							
Trimmings							
Glass							
Upholstery							
Heaters, Stoves							
Freight—Expres							
Labor: Lumber							
Mill							
Blacksmith							
Bolt Room							
Iron Machine							
Car Builder							
Tinsmith							
Pipe Fitter							
Upholsterer							
Painter							
Yard							
General Labor							
" Expe							
Recapitulation:							
Trucks—Materia							
Labor							
General Expe							
Body—Materials							
Labor							
General Expe							
Switching R							
Patterns, Temp.							
Delivery							

Bill of Material in one.....**for**.....

Lot.....

.....,

.....,

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.		Rough Size.		B. M.
..	.....	.....	x	x	x	x	....
..	.....	.....	x	x	x	x	....
..	.....	.....	x	x	x	x	....

Bill of Material in one.....for.....

Lot..... .....

....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one ..... for .....

Lot. ....

....

WROUGHT IRON.

Weight	Size of Blank.	Finished Size.	Smith.	Bolt.	Iron Mach'n.	Description.	Pcs.	Nuts	W. W.	C. W.

Bill of Material in one.....**for**.....

Lot.....

.....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

Weight.	Size of Blank.	Finished Size.	Smith.	Bolt.	Iron Mac'h.	Description.	Pcs.	Nuts.	W. W.	C. W.

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one ..... for.....

Lot..... .....

....

WROUGHT IRON.

C. W.	W. W.	Nuts	Pcs.	Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one.....**for**.....

Lot..... .....

.....; .....,

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.		Rough Size.		B. M.
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....

Bill of Material in one.....**for**.....

Lot..... .....

....., ...,

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.		Rough Size.		B. M.
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....

Bill of Material in one.....**for**.....

Lot.....

.....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one.....for.....

Lot..... .....

....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one .....for.....

Lot..... .....

....

WROUGHT IRON.

Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.	C. W.	W. W.	Nuts.	Pcs.

Bill of Material in one ..... **for**.....

Lot..... ....

....

WROUGHT IRON.

Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.
C. W.						
W. W.						
Nuts.						
Pcs.						

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.	Pcs.	Nuts.	W. W.	C. W.

Bill of Material in one .....for.....

Lot..... **.....**

..... **.....**

WROUGHT IRON.

C. W.	W. W.	Nuts.	Pcs.	Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one.....for.....

Lot..... .....

....., ...

Per Car.	MISCELLANEOUS.	Per Lot.	

Bill of Material in one.....for.....

Lot..... .....

....., ...

Per Car.	MISCELLANEOUS.	Per Lot.	

THE .....

ESTIMATED COST .....

SPECIFICATION.	Brakes		Roof		Door		Remarks
	Pattern	Amount	Quantity	Amount	Quantity	Amount	
Lumber							
Kiln Drying							
Castings—Gray							
" Malleable							
" Steel							
" Brass							
Wrought Iron							
Metals							
Nuts—Square							
" Hexagon							
Wrought Washers							
Nails							
Screws							
Springs							
General Merchandise							
Roof							
Couplers							
Turnbuckles							
Doors							
Grain Doors							
Brakes							
Pipes and Fittings							
Brake Beams							
Paint Materials							
Paper							
Hair Felt							
Trimmings							
Glass							
Upholstery							
Heaters, Stoves							
Freight—Express							
Labor: Lumber Yard							
Mill							
Blacksmith							
Bolt Room							
Iron Machine							
Car Builder							
Tinsmith							
Pipe Fitter							
Upholsterer							
Painter							
Yard							
General Labor							
" Expense							
Recapitulation:							
Trucks—Materials							
Labor							
General Expense							
Body—Materials							
Labor							
General Expense							
Switching Royalty							
Patterns, Temp., Form.							
Delivery							

Bill of Material in one.....**for**.....

Lot..... .....

....., ...,

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.	Rough Size.	B. M.
..	.....	....	x x	x x	....
..	.....	....	x x	x x	....
..	.....	....	x x	x x	....

Bill of Material in one.....for.....

Lot..... .....

....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one.....for.....

Lot..... .....

....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one ..... for .....

Lot ....

....

WROUGHT IRON.

Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.	C. W.	W. W.	Nuts	Pcs

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

Weight.	Size of Blank.	Finished Size.	Smith.	Bolt.	Iron Mac'h.	Description.	Pcs.	Nuts.	W. W.	C. W.

Bill of Material in one .....for.....

Lot..... **.....**

..... **.....**

WROUGHT IRON.

C. W.	W. W.	Nuts.	Pcs.	Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one .....for.....

Lot..... **.....**

..... **.....**

WROUGHT IRON.

Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.	C. W.	W. W.	Nuts.	Pcs.

Bill of Material in one.....for.....

Lot..... .....

....., ...

Per Car.	MISCELLANEOUS.	Per Lot.	
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

THE .....

ESTIMATED COST .....

SPECIFICATION.	Brakes		Roof		Door		Remarks
	Quantity	Amount	Quantity	Amount	Quantity	Amount	
Lumber							
Kiln Drying							
Castings—Gray							
" Malleable							
" Steel							
" Brass							
Wrought Iron							
Metals							
Nuts—Square							
" Hexagon							
Wrought Washers							
Nails							
Screws							
Springs							
General Merchandise							
Roof							
Couplers							
Turnbuckles							
Doors							
Grain Doors							
Brakes							
Pipes and Fittings							
Brake Beams							
Paint Materials							
Paper							
Hair Felt							
Trimmings							
Glass							
Upholstery							
Heaters, Stoves							
Freight—Express							
Labor: Lumber Yard							
Mill							
Blacksmith							
Bolt Room							
Iron Machine							
Car Builder							
Tinsmith							
Pipe Fitter							
Upholsterer							
Painter							
Yard							
General Labor							
" Expense							
Recapitulation:							
Trucks—Materials							
Labor							
General Expense							
Body—Materials							
Labor							
General Expense							
Switching Royalty							
Patterns, Temp., Form.							
Delivery							

Bill of Material in one.....**for**.....

Lot..... .....

....., ...,

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.		Rough Size.		B. M.
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....

Bill of Material in one.....**for**.....

Lot..... .....

....., ...,

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.		Rough Size.		B. M.
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....

Bill of Material in one.....for.....

Lot..... .....

....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one.....for.....

Lot..... .....

....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.	C. W.	W. W.	Nuts.	Pcs.

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

Description.	Iron Mach.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Freight Car, 30 Ton, Stock, Illustration 95
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" " Standard Sizes 368
" " Weight of 368
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" " " " Black Sheet 366
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Gould Draw Gear, Illustration 126
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" " " " Bill of Material 53
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Bill of Material in one .....for.....

Lot..... **.....**

..... **.....**

WROUGHT IRON.

O. W'k.	W. W'k.	Nuts.	Pcs.	Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

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" Lumber Yard 11
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" Pattern Department 13
" Planing Mill 12
" Iron Department 11
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LeGros Roof, Illustration 233
" " Bill of Material 234
Liquid Measure 322
Long " 320

Bill of Material in one.....for.....

Lot.....

.....,

Per Car.	MISCELLANEOUS.	Per Lot.	

THE.....

ESTIMATED C of.....

SPECIFICATION.	Brakes	Roof		Door		Remarks
	Amount	Quantity	Amount	Quantity	Amount	
Lumber						
Kiln Drying						
Castings—Gray						
" Malleable						
" Steel						
" Brass						
Wrought Iron						
Metals						
Nuts—Square						
" Hexagon						
Wrought Washers						
Nails						
Screws						
Springs						
General Merchandise						
Roof						
Couplers						
Turnbuckles						
Doors						
Grain Doors						
Brakes						
Pipes and Fittings						
Brake Beams						
Paint Materials						
Paper						
Hair Felt						
Trimmings						
Glass						
Upholstery						
Heaters, Stoves						
Freight—Express						
Labor: Lumber Yard						
Mill						
Blacksmith						
Bolt Room						
Iron Machine						
Car Builder						
Tinsmith						
Pipe Fitter						
Upholsterer						
Painter						
Yard						
General Labor						
" Expense						
Recapitulation:						
Trucks—Materials						
Labor						
General Expense						
Body—Materials						
Labor						
General Expense						
Switching Royalty						
Patterns, Temp., Form						
Delivery						

Bill of Material in one.....**for**.....

Lot..... .....

....., ...,

LUMBER.

Pcs.	Description.	Mat'l.	Finished Size.		Rough Size.		B. M.
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....
..	.....	....	x	x	x	x	....

Bill of Material in one.....for.....

Lot..... .....

....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one.....for.....

Lot..... .....

....

CASTINGS.

Pcs.	Patterns	Description	Material	Wt.	

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

Description.	Iron Mach.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.	C. W.	W. W.	Nuts.	Pcs.

Bill of Material in one ..... **for** .....

Lot ....

....

WROUGHT IRON.

C. W.	W. W.	Nuts.	Pcs.	Description.	Iron Mach.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one ..... **for** .....

Lot ....

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WROUGHT IRON.

C. W.	W. W.	Nuts	Pcs.	Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one .....for.....

Lot..... **.....**

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WROUGHT IRON.

C. W.	W. W.	Nuts.	Pcs.	Description.	Iron Mac'h.	Bolt.	Smith.	Finished Size.	Size of Blank.	Weight.

Bill of Material in one.....for.....

Lot.....

.....,

Per Car.	MISCELLANEOUS.	Per Lot.	